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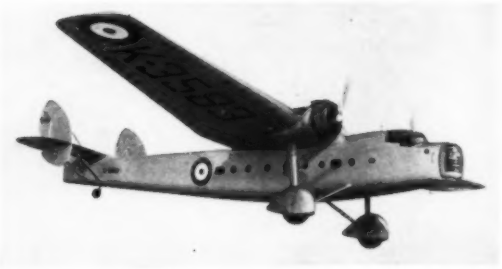

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Discovering Civil Aviation

LAST week the House of Commons suddenly became "air-minded," and showed unprecedented excitement about British civil aviation, which was alleged to be the laughing stock of Europe; there were references to German pilots hanging a bird-cage on the tail of a British machine, and so forth. Yet when all the allegations are sifted and the items on the debit side of the ledger balanced against those on the credit side, any fair-minded observer must come to the conclusion that British achievements on the Empire routes far and away outweigh the shortcomings at home.

That is not to say that all is well with British civil aviation. There are many things which can be improved, and which must be improved without delay. But these shortcomings are not new ones; they have not come upon us suddenly like a thief in the night. Mr. Perkins' case lost force by his blaming Imperial Airways for things over which it has no control and for which, therefore, it cannot in all fairness be blamed. For all that, the debate on Wednesday of last week (reported on page 527) should have been welcomed by everyone who has the future of British civil aviation at heart. If it did nothing else it served to focus attention on a number of things which have needed ventilation for a very long time.

If the speeches made during the debate are analysed it is found that, leaving out the question of pilots' right to collective bargaining, which actually is a matter for settlement elsewhere, the criticisms were directed against the uses of out-of-date machines, lack of blind-landing equipment, absence of de-icers and anti-icers, the freezing-out of air traffic by the ban of the railways on booking facilities, and the lack of support for municipal aerodromes.

That Imperial Airways have not yet received their machines of the Ensign class is scarcely the fault of the company. The order was placed towards the end of 1934 for fourteen of these machines. Delivery was promised for the end of 1936, and normally that date would probably have been kept. Then came the R.A.F. expansion, which meant that the Armstrong Whitworth works at Coventry had to concentrate on the production of military aircraft. The works at Hamble were inadequate and had to be very greatly enlarged, there were difficulties about finding skilled workers in the district, and the suddenly increased demand for materials caused further delays. The result of all this is that the fourteen machines of the Ensign class will be delivered about a year late. No one in particular is to blame, and it seems to us that Imperial Airways are, if anything, to be praised for their courage in ordering a large batch of machines "off the drawing board." The same procedure was followed in the case of the Short Empire class of flying boats, and worked perfectly.

When these machines *are* placed on the European and on certain sections of the Empire routes, they will bear comparison with aircraft of other nations. In the matter of performance and modernity, the Albatross machines recently ordered by Imperials will be well ahead of competitors in spite of a comparatively modest power expenditure. The delay is regrettable, but it is difficult to see how it could have been avoided.

Re-awakening

MOST of the other criticisms raised last week have been voiced in *Flight* on and off for the last two or three years. In the matter of restricting booking facilities, particularly, we led the campaign, which was afterwards taken up by others. We have criticised the Air Ministry for its tardiness in installing the Lorenz blind-approach system, and pointed out that, although it might not be perfect, it worked tolerably well, and had the great further advantage that it is used extensively on the Continent.

Mr. Perkins' attempt to convey the impression that Imperial Airways' record for safety is no longer deserved will be generally regretted. To quote merely an increase in casualty figures without taking into full account the increase in passenger miles is almost certain to lead to erroneous conclusions, and to take one example and say that one company has killed eleven passengers in one year while another has killed only one is very unfair. Almost at that very moment the other company had been unfortunate, and the position was almost reversed. Such comparisons do no good, and can do a great deal of harm. Only by examining the statistics over a period of years, and taking into account not only mileage but geographical and climatic conditions of routes, can a just and fair comparison be made.

If those who now clamour so loudly for vast improvements in British European civil aviation will stop for a moment to think they will realise that they could have

had all they are now asking for if they had been prepared to foot the bill. Ever since Mr. Winston Churchill uttered the now-famous slogan that "Civil Aviation must fly by itself," successive Governments have had that ideal before them in planning the subsidy arrangements, and until that great all-Empire-mail-by-air-without-surcharge scheme came into being, the subsidies paid have not been such as to make any vast contribution towards upholding British prestige in face of foreign competition.

Actually, it seems to us that Mr. Perkins, who proposed the motion, and Lt.-Col. Moore-Brabazon, who seconded it, defeated their own ends by asking for an inquiry, and it is a little surprising that an old Parliamentarian like Moore-Brabazon should be caught in that way. We have had committees galore. Let us recall the Gorell Committee, the Maybury Committee, the Inter-departmental Committee on International Air Communications, the Empire Air Mail Committee, Transatlantic Flight Committee and the Civil Airworthiness Committee—and there were probably one or two more. First of all, there is a lot of time lost in examining witnesses and hearing evidence; then a committee discusses matters and, after a time (a long time, usually), it issues its recommendations. Then the Government has to ponder the recommendations and decide upon whether or not to "implement" them. Usually, by the time the implement has been chosen it is nothing like a spade, and at the best a year or two has lapsed.

One cannot help feeling that Rear-Admiral Sir Murray Sueter was right when he proposed his amendment to the Motion. He recalled that it had always been his experience that when there was anything of real importance to thrash out, the Prime Minister of the day could always be relied upon to lend a sympathetic ear. That had been so with Asquith, Bonar Law, Ramsay MacDonald and Baldwin, and there seems little doubt that had this direct method been adopted we should have got results much quicker. Sir Murray Sueter knows, no one better, what can be done in the way of cutting through red tape with the right sort of scissors. When he was in charge of the R.N.A.S. during the war he must have been a thorn in the side of the big-wigs, but how he did get things done!

That the Government was not slow in recognising the easy way out offered them by the request for an inquiry is shown by the alacrity with which they announced the setting-up of a departmental inquiry under the chairmanship of Lord Cadman. No one will find fault with the constitution of the committee, but by the time it has held its meetings, examined the evidence, issued its recommendations, and the Government has announced what it proposes to do about it all, a year or more will have passed, and by then it seems likely that most of the causes for the present criticisms will have disappeared. And in any case the Cadman committee will not deal with matters already dealt with by the Maybury committee.

Reviewing the Field

FROM the very black picture painted in the House of Commons last week the uninitiated might well jump to the conclusion that stagnation has robbed the British aircraft industry of the versatility which it once possessed. A perusal of this week's special number of *Flight*, which is a detailed review devoted to British civil and military aircraft, should act as a healthy tonic for the sceptics.

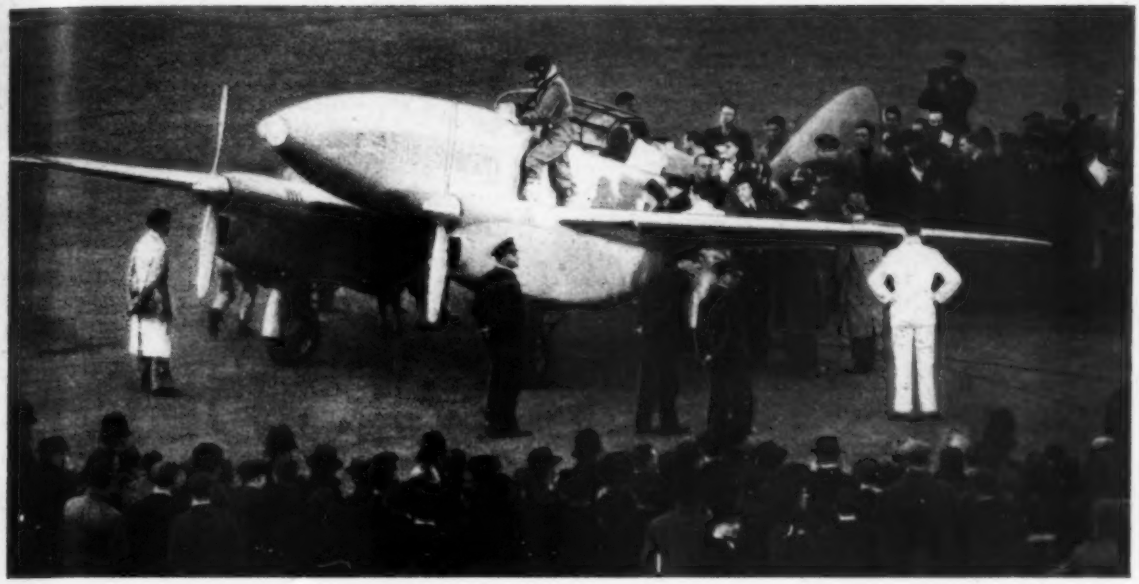
Of the numerous current types of British aircraft dealt with in this issue it will probably come as a surprise to many to discover that very considerably more than half are civil aeroplanes of one sort or another. That does not look as if the R.A.F. expansion has killed all initiative in the production of civil types. What does emerge is that the ultra-light aeroplane has lost ground, that in the small and medium-size classes this country has a wide choice of types to offer, and that in the large class the number of types is greater than might have been expected.

To some extent the slowing-down in the production of ultra-lights is due to the introduction of Government-assisted schools. If a man can learn to fly, and can put in a fair amount of flying at Government expense, he can scarcely be blamed for hesitating to spend his money on buying his own light aeroplane.

At the other end of the scale, among the really heavy stuff, the number of types is naturally fairly small. The number of potential purchasers is obviously strictly limited, but in spite of this fact, there is cause for satisfaction in the knowledge that types like the Armstrong Whitworth Ensign and De Havilland Albatross are soon to be put on the routes, while the Short Empire boats are already in service.

On the military side, although the number of types is smaller, the output is, of course, very much greater numerically. The middle pages of this issue convey a very good idea of what British constructors of military aircraft have to offer, and in spite of the R.A.F. expansion several of the manufacturing firms have found time to

FASHION FOR FIGHTERS: A first view (secured at Brooklands last Monday) of the production-type Hawker Hurricane single-seater multi-gun fighter (Rolls-Royce Merlin II) in its coat of camouflage. The lower surfaces are silver. Among the minor differences from the prototype are the tail trimming tabs and the streamline exhaust manifold. (*Flight* photograph).



HOMECOMING TRIUMPHANT : F/O. Clouston and Mrs. Kirby-Green bring the D.H. Comet to the Croydon tarmac after their remarkable flight to Cape Town and back in 45 hours (outward) and 57 hours (homeward). The story of the achievement appears on page 512.

build machines for export. Others are being built under licence.

The picture of the British aircraft industry will be continued in *Flight* next week, when the products of more than 300 firms will be described and illustrated. They will include aero engines, accessories, equipment and materials.

The Comet Again

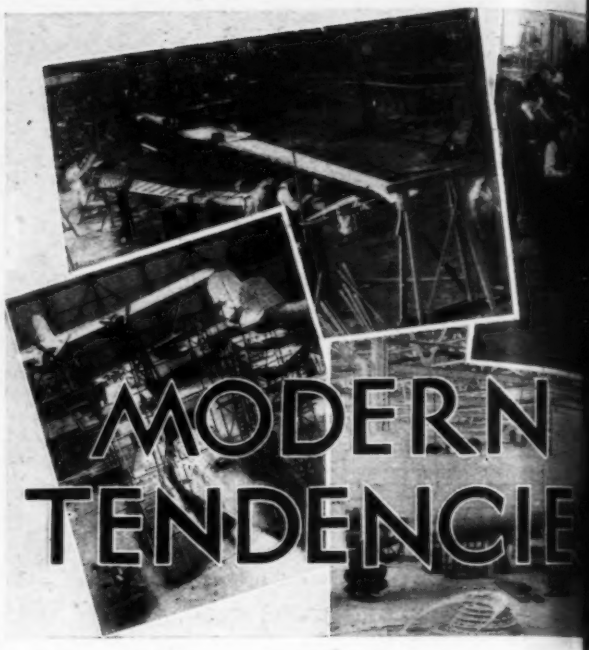
SENSATION-SEEKING newspapers have very much missed the point of the fine flight of F/O. Clouston and Mrs. Kirby-Green to Cape Town and back. Many of the comments and headlines spoke of lowering records set up by Miss Amy Johnson (as she wishes to be called) and Mr. Brook, both of whom flew solo. When a Comet was put on to the routes to and from the Cape one expected that its times would be a good deal better than those set up by any solo pilot in a sports tourer. The Comet was specially designed by the De Havilland firm for the Melbourne race, and was a triumph of fitting design into the conditions of the race, for it fulfilled all the I.C.A.N. requirements about take-off when carrying enough fuel to fly non-stop from Mildenhall to Baghdad, and it was at the time the only aeroplane in the world which was capable of such an effort at a cruising speed of 200 m.p.h. Therefore, it is in no sense a freak machine, but a special design which achieved its purpose to perfection. Naturally, it could beat the times of all the solo pilots on the route to and from the Cape.

Whereas the records which have been set up by solo pilots belong chiefly to the category of sport, these flights of the Comet may perhaps be the shadows cast by coming events. They suggest that some day mails may be hurried across the Empire in fast, comparatively small machines developed from the Comet class. Hitherto the policy of Imperial Airways has been to send both mails and passengers in the same machine; and at the moment there is no better compromise for that purpose than the Short Empire boats. But now all first-class mails to Africa are sent by Imperial Airways, and the load is likely to grow as the opportunity creates and increases the traffic. Already it appears in the last report of Imperial Airways that, for one period, when they were short of machines, mails had to be carried to the exclusion of passengers. A further increase in both forms of freight may in time force all operating companies to use separate machines for passengers and mails. In the Albatross there exists a machine which may be called a scaled-up version of the Comet, and it must be remembered that the Comet and Albatross *cruise* at 200 m.p.h. or more, while the *top* speed of the Empire boats is just a trifle under that figure. That also seems to point the way to special mail aeroplanes in the future. It may turn out that on the Africa run Imperial Airways will not need the two classes because of the division of routes agreed on with the Union Government. Traffic in Northern Africa down to, say, Kisumu is heavy; across Central Africa it is much lighter; but when South Africa is reached there are again possibilities of heavy traffic once more. In Union territories, however, the Imperial Airways boats follow the coast down to the terminus at Durban, while the inland routes are worked by South African Airways. The latter may not feel that at present there is any call for them to use special mail aeroplanes, but the time may come when the traffic may force such a step upon them. The same thing may happen in time on the transcontinental route to Canada, and also on the inland services of Australia. Crossing the Atlantic is a special case, in which the odds seem to be on the special mail aeroplane. For through-services across the Empire it still appears that the flying boat with its compromise between speed and comfort (the comfort is very considerable) is likely to hold the stage for a long time.

IN THIS SPECIAL ISSUE:

	Page		Page
The Outlook	499	British Military Aircraft Reviewed	514a
Modern Tendencies	502	Britain's Small Civil Aircraft Reviewed	515
The Four Winds	505	British Gyroplanes	523
Britain's Large Commercial Aircraft Reviewed	506	Diary of Forthcoming Events	523
The Cape Record	512	Service Aviation	524
Wing Loading: A Lecture Discussion	513	Commercial Aviation	526
Correspondence	514	Private Flying	529

A Survey of Present Practice in Aerodynamic and Structural Design : The Ascendancy of the Twin-engined Type : Multi-gun Turrets, but Adherence to Small Calibres



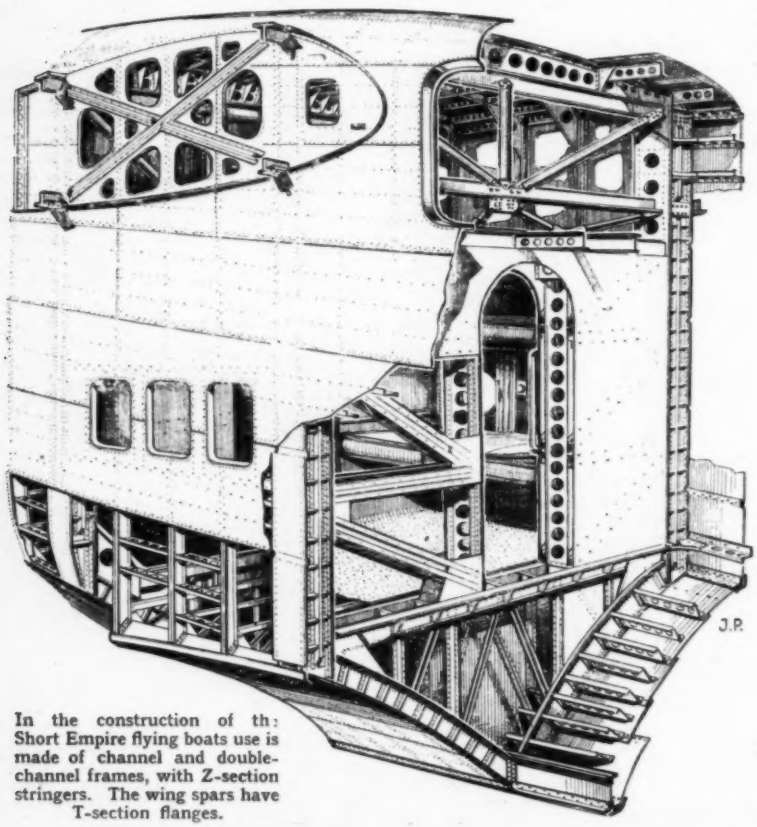
MONOCOQUE fuselages and stressed-skin wing construction are characteristics of a large proportion of modern British aircraft types, civil as well as military.

In the case of fuselages the chief advantage, apart from the question of withstanding extremes of temperature and humidity, is that the unobstructed space left inside, for a given overall cross-section, is a maximum. In the older girder type, the rounded fairings added to the rectangular-section primary structure was of little use for stowage of equipment, or for affording freedom of movement to the crew. The disadvantage of the monocoque fuselage, more particularly in aircraft of small and medium size, is the impossibility of reaching in from outside while installing equipment. Thus a smaller number of men can work on the installation of equipment in a small monocoque fuselage than in one of the girder type. With the high performances now attained, the drag of the metal-clad fuselage may also be slightly smaller than that of the fabric-covered variety, in which there is bound to be a certain amount of sagging of the fabric covering, no matter how skilfully the fabric is attached to the framework.

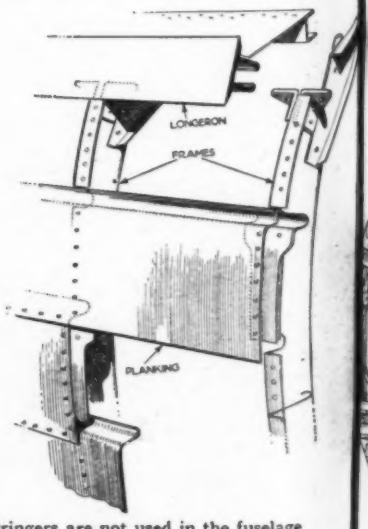
There is a school of thought which holds that we have been blinded by the superficial attractiveness of the metal-clad fuselage, which is pleasing to the eye and looks well, and that from a practical point of view the old-fashioned fabric-covered girder has much to recommend it.

In the matter of wing construction there is still observable a struggle between the all metal-clad and the partly metal-covered types. It is not, for instance, unusual to come across a wing in which the forward portion, from leading edge to rear spar, is planked with metal, while the trailing edge ribs are of girder type and covered with fabric. This portion of the wing contributes little to the bending strength of the wing, and is regarded by many as a mere fairing, to be built for as little cost, in weight, as possible. In the sizes of aircraft built up till now there is no doubt that a girder-rib-fabric-covered trailing edge is the lightest possible structure.

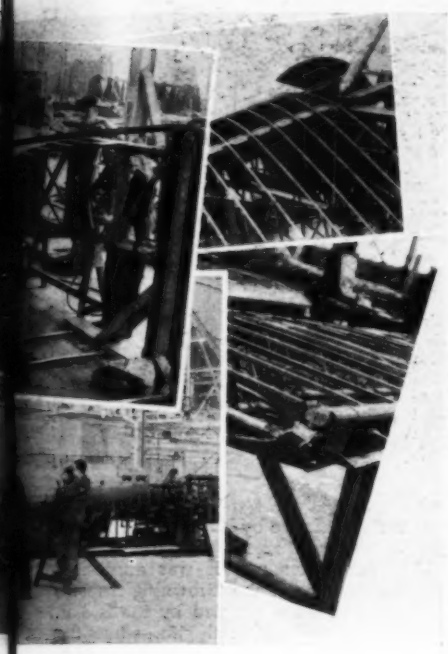
In the construction of the main spar box there is no unanimity among designers. Some prefer the distributed material type, in which a close approach is made to the monocoque or "lobster claw" ideal. At one time the multi-spar form of construction was thought to offer a solution, but it has never come into general use, chiefly because of manufacturing expense. One of the closest approaches to the

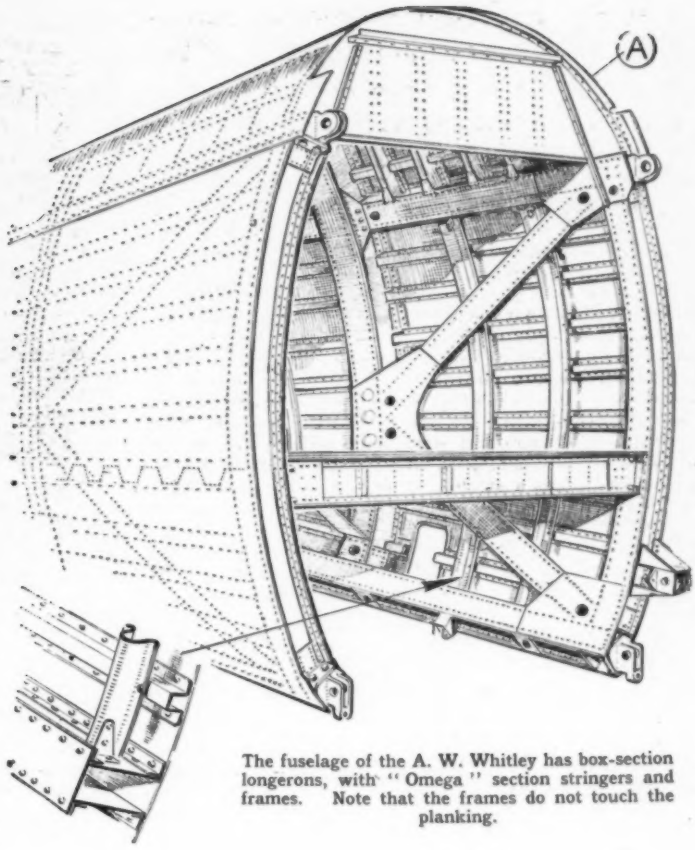


In the construction of the Short Empire flying boats use is made of channel and double-channel frames, with Z-section stringers. The wing spars have T-section flanges.



Stringers are not used in the fuselage of the Fairey Battle, their place being taken by the curled-over edges of the planking.





The fuselage of the A. W. Whitley has box-section longerons, with "Omega" section stringers and frames. Note that the frames do not touch the planking.

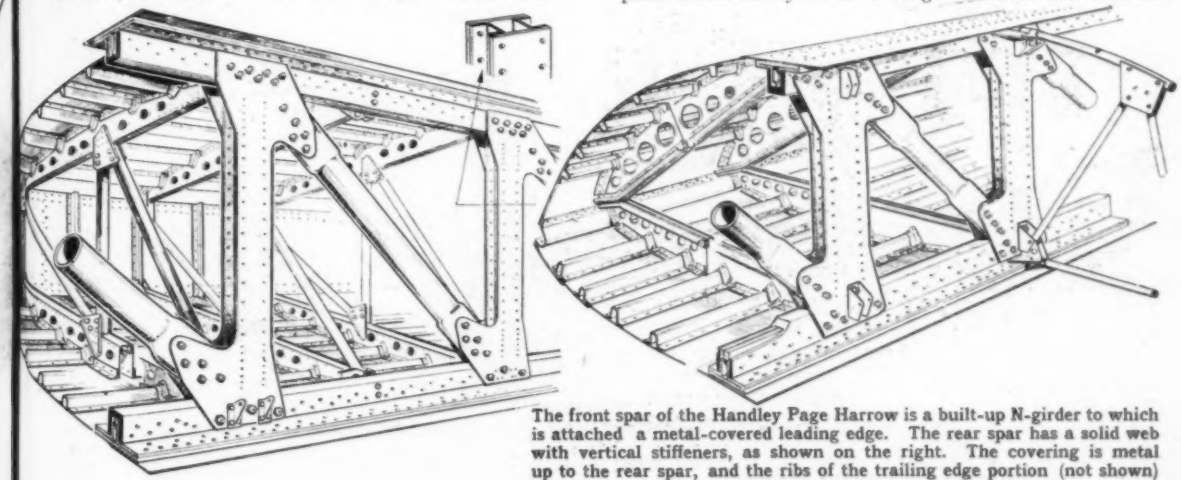
multi-spar type of wing is, perhaps, that of the Fairey Battle, in which there are two main spars, certainly, but which shows a number of closely spaced Z-section stringers riveted to the skin.

Other designers prefer what may be termed the concentrated flanges type of construction. An example of this is the wing spar of the Short Empire boats, with T-section extruded strips in the corners, and fork-ended struts and ties for the bracing. A variation of this theme is found in the Handley Page Harrow, which has a girder front spar and a solid-web rear spar, with spanwise stringers in between.

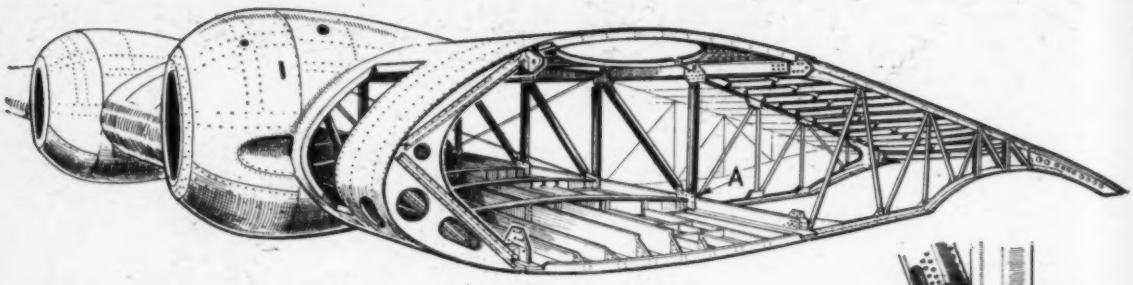
A different type of construction is employed in the Armstrong Whitworth Whitley. Here the main spar is a box, with top and bottom of spanwise corrugated Alclad and with sides of the same material, but having the corrugations vertical. A capping strip of channel section covers top and bottom edges of the vertical corrugations to prevent them from deforming. From a manufacturing point of view this is probably about as simple a type of construction as could be evolved, the only complication introduced being the tubular ties needed to stabilise the surfaces of the box.

Aerodynamic Design

A survey of the field of military and commercial aircraft shows the complete disappearance of the large biplane. This is due not so much to the marked superiority of the monoplane as such but to the incidental advantages which the monoplane offers. To begin with, the thicker wing of the monoplane probably offers as great profile drag as the thin aerofoil of the biplane, plus its struts and bracing. But the thicker monoplane wing affords stowage space for the undercarriage, and as, in a high-performance aircraft, the undercarriage may account for as much as one-sixth of the total drag, its retraction has become a matter of primary importance. In addition, the thick wing root of a monoplane is also handy for the stowage of fuel tanks and bombs.

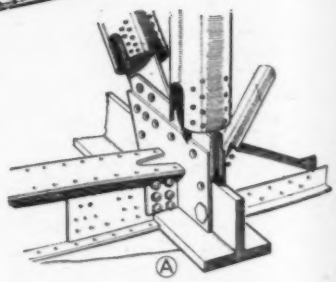


The front spar of the Handley Page Harrow is a built-up N-girder to which is attached a metal-covered leading edge. The rear spar has a solid web with vertical stiffeners, as shown on the right. The covering is metal up to the rear spar, and the ribs of the trailing edge portion (not shown) are girders with fabric covering.

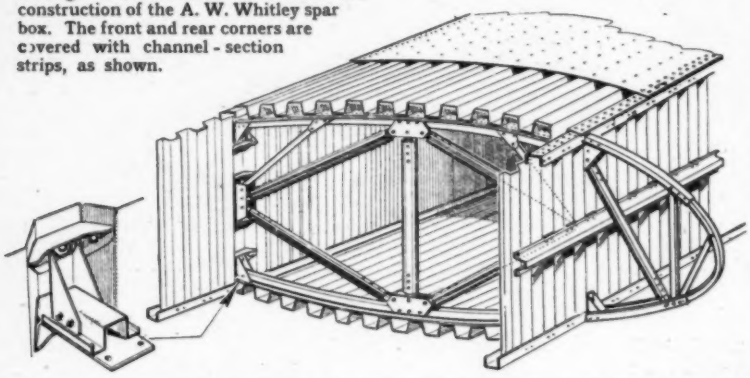


The price to be paid for the saving in drag, the weight difference between the foot-deep monoplane spar and the chord-deep biplane, has been more than made up by slots and, during recent years, by the introduction of trailing edge flaps, which give a great increase in lift. Thus the much more heavily loaded monoplane has a stalling speed little or no higher than that of the biplane.

Owing to the ease with which the retractable undercarriage can be "buried" in it, the wing set low on the fuselage has become the most popular arrangement. Interference drag between wing and fuselage, particularly pronounced with the low-wing arrangement, can be reduced by fillets so that the overall drag is comparable with that of other wing arrangements.



In the Short Empire boats the main wing is a girder box with T-section extruded corner flanges. Bracing is by fork-ended tubes, as shown in the right-hand sketch.



Corrugated Alclad sheet is used in the construction of the A. W. Whitley spar box. The front and rear corners are covered with channel-section strips, as shown.

Although the most popular, the low-wing arrangement is by no means universal. Certain bombers, for instance, have the wing placed approximately midway on the sides of the fuselage, this placing permitting the stowage of bombs in the lower part of the fuselage. The high-wing arrangement is also used in some cases, but the retraction of the undercarriage is then a more difficult problem, and carefully "spatted" wheels are used instead. The fixed undercarriage relieves the pilot of one extra control to operate, and probably maintenance in the field is slightly easier.

Interesting comparisons between the work of two designers can sometimes be made. A case in point is the Hawker P4/34, now named the Henley, and the Fairey P4/34. Designed to the same specification, these two machines differ in the sizes of their fuselages, the Hawker having a large fuselage inside which the bombs can be stowed, while the Fairey has a much smaller fuselage and carries its bombs externally. It is believed that there is very little difference in the performances of these two monoplanes, which are fitted with the same engine, the Rolls-Royce Merlin.

Armament

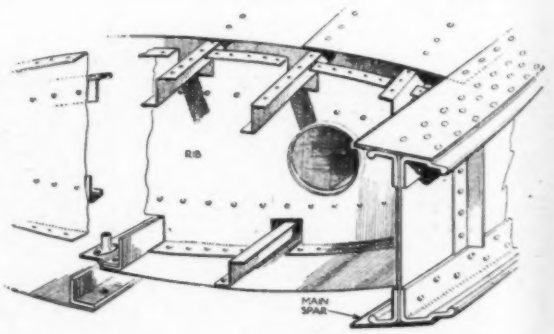
The much greater speed of modern military aircraft has brought extra problems for the armament specialist as well as for the aircraft designer. Manual operation across a wind of 300 m.p.h. is not feasible and power-operated machine guns, or, rather, machine guns housed in power-operated turrets, have become a necessity. A number of manufacturers produce their own versions, but the gun turret designed by Nash and Thompson is finding increasing favour.

Some time ago it was announced that the American Browning machine gun had been adopted by the R.A.F. as a standard fixed gun, while the new drum-fed Vickers is used as a free gun. No small-bore British "cannon" has yet been announced, although some foreign air forces are using one or other of the types available. In this country we seem to rely on the number of guns rather than on calibre and range. This policy may have to be revised.

The disposition of free guns is one of the major problems confronting the designer of a modern bomber. In this country we have a partiality for stern turrets, as typified by those in the H.P. Harrow and A.W. Whitley, though the inclusion of tail armament may present some serious aerodynamic problems. Vickers, in the Wellington, have made a creditable effort to keep down the drag of a tail-gun installation.

The downward-firing gun in the bottom of, or below, the fuselage persists in the Whitley and Hampden. So far British designers have not adopted the streamline "blisters" for guns which characterise certain new American types.

Details of bombs and torpedoes are hard come by, but there is little doubt that our torpedo dropping equipment and technique is unusually good. The internal stowage of bombs has presented problems—particularly in dive bombers—but none has so far proved unduly difficult.



Extruded angle-sections are used in the built-up flanges of the main wing spars of the Fairey Battle. The ribs are solid and recessed for the Z-section stringers, which are riveted to the metal skin.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

A WOMAN who "wrote the number of a low-flying Service machine in lipstick" gave evidence at a court martial at Northolt last week.

An amendment to the Air Navigation Order, issued by the Air Ministry, exempts police aircraft from the ban on flying over crowds.

Flying at about 20,000ft., a squadron of Italian Fiat fighters recently crossed the Andes from Chile to Argentina in 40 minutes. The machines have been taking part in "good will" celebrations.

Miss Jean Batten, who recently broke the Australia-England record, was summoned to the Palace last week. She was received by H.M. the Queen and by H.M. the King of the Belgians, with whom she had a long conversation.

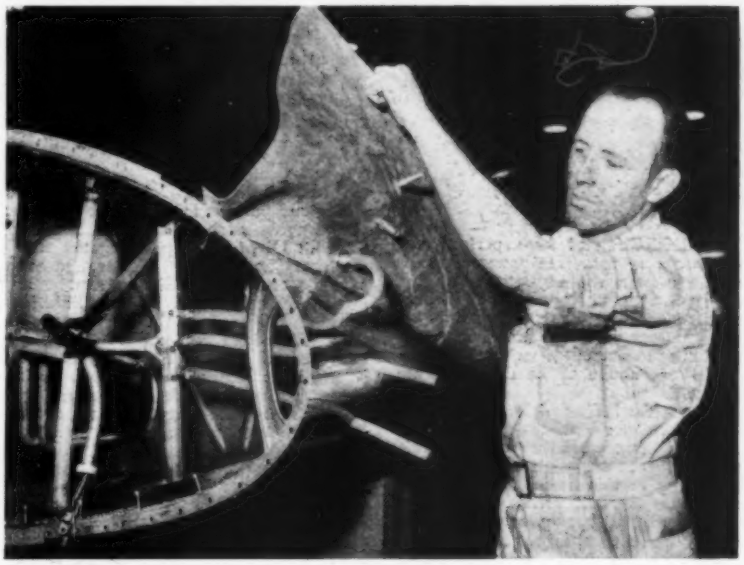
Rumania has ordered thirty Italian Nardi F.N.305 trainers, two dozen Savoia Marchetti S.79 bombers and six Savoia Marchetti S.83 transports. The S.83s, like the bombers, are triple-engined machines and are capable of about 260 m.p.h.

A number of prints relating to the very early history of aeronautics are among recent additions to the Science Museum, South Kensington. There are contemporary engravings depicting the flight of the Montgolfier balloon with a sheep, a cock and a duck.

Twenty-five Years Ago

(From "Flight," November 23, 1912).

"On Thursday last week Mr. Gordon England, at Filton, went out for the first time on one of the new Bristol tractor biplanes in which pilot and passenger sit in tandem. He made a really fine flight, remaining up for about half an hour and landing well. The machine answers the controls perfectly and shows a fine speed. On Friday, England ascended at 1.45 p.m. and flew for quite half an hour, the outstanding feature of his trip being the beautiful *vol plane* in landing."



PROTECTIVE PULSATIONS: Installing the latest Goodrich de-icing equipment on the leading edge of a T.W.A. Douglas. It is arranged so that pulsations of air through rubber tubing under the rubber covering break off the ice as soon as it forms. The device is controlled by a master valve and pressure is obtained from the engine exhaust. The pulsations raise the covering about half an inch.

Bob Buck, Harold Neumann and Roger Don Rae, three of the most dashing and successful pilots at American National Air Races, have become pilots for Transcontinental and Western Air, the great American transport concern.

A Cant Z.506 seaplane (Italian), fitted with three Pegasus-type engines, has climbed to 24,311ft., carrying a useful load of 4,400lb. (2,000kg.). The former record in the same category was held by the same type of machine.

The Air Ministry announces that the Royal Aero Club has been officially informed that Flt.-Lt. M. J. Adam's height record of 53,937ft., attained on June 30 this year in the Bristol 138a, has been homologated by the F.A.I.

Captain J. W. C. Martyr, who has died in Manchester at the age of 86, qualified for his pilot's licence when he was 80. He made his first flight when he was 76.

Major James Doolittle has taken delivery of a single-seater Seversky to be used for experimental flying at heights between 25,000 and 30,000 ft., operating on Shell 100 octane Ethyl Aviation fuel.

The Air Patrol formed by members of the 30th Plymouth troop of Boy Scouts has, in its first year of operation, given such satisfactory results that the experiment is to be extended to the localities of Exeter, Ramsgate and Ipswich, whose municipal airports, together with that of Plymouth, are under the management of the Straight Corporation Limited.

A POTENTIAL CHAMPION: A Vickers Wellesley medium bomber (Pegasus XX) complete with streamline bomb-carriers below its wings. It is possible that a specially prepared Wellesley may try for the world's long-distance record.

British Commercial Aeroplanes

A Review of Fifteen Types with Seating Accommodation for More Than Five Passengers

IT is always rather difficult to draw a hard-and-fast distinction between commercial and private or owner-pilot types of aircraft. If a three-seater of 130 h.p. is used for taxi work it is being employed commercially; conversely, a ten-passenger aeroplane may be the property of a private owner, and in that capacity will never be used to carry fare-paying passengers. For the purpose of grouping British civil aircraft types into two classes we have treated machines up to 4-5-seaters as private types, and those with larger capacity as commercial. A review of the smaller types will be found on pages 515-522.

In the following pages the main aerodynamic and structural features of each type are described, and numerical data will be found grouped in the table on page 511.

AIRSPEED

EFFICIENCY and high performance for a very moderate power expenditure have been the keynotes of design ever since Messrs. Norway and Tiltman began operations in a small factory at York. Some years ago the firm transferred to Portsmouth, where all the three types about to be described are produced.

The Airspeed *Envoy Series III* is a high-performance twin-engined low-wing cantilever monoplane with retractable undercarriage. Incidentally, it is worth mentioning in this connection that Airspeeds were the first British firm to produce a modern type of aeroplane with retractable undercarriage, and their particular type has proved very reliable in service, one operating firm alone having made 20,000 landings in two years.

Wooden construction is employed in the Envoy, the wings being of the orthodox two-spar type with stressed-skin covering of plywood. A pronounced taper characterises the wings of all Airspeed machines, and in the Envoy the trailing-edge flaps, of metal construction, extend from aileron to aileron, across the bottom of the fuselage. The flaps are in five sections, and can be set at any angle up to 78 deg. The flap angle is indicated on a special instrument on the dashboard.

The fuselage is of semi-monocoque construction and built in two sections, joined together by fishplates and by the plywood covering. The cabin can be arranged to seat up to eight passengers, but when that number is carried there is no toilet compartment, and a more usual arrangement is for six passengers, or four with a maximum of comfort. In all arrangements the luggage compartment is retained.

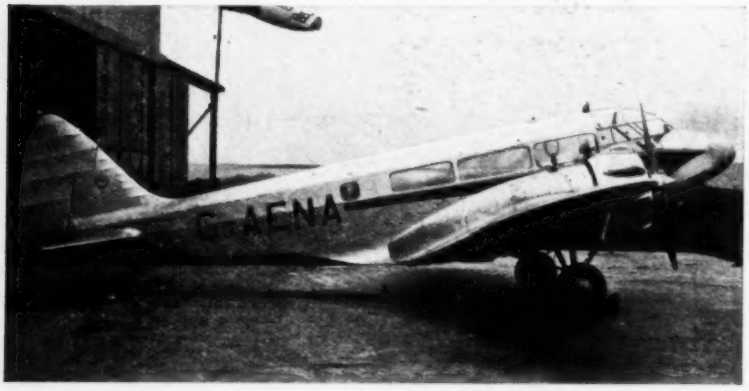
Various power plants can be used in the Envoy Series III, the Siddeley Cheetah IX of 350 h.p. being the standard at home, but Walter, Jacobs, Wrights and Gnome-Rhones can be installed if desired. With two Siddeley Cheetah IX engines the Envoy has a disposable load of 2,130 lb. when equipped to carry six passengers. In spite of the relatively low power of its engines, the machine cruises at 170 m.p.h. at 10,000ft., and has a range of 620 miles with normal tanks, or 1,000 miles with auxiliary tanks.

A dual-purpose version of the Envoy is an attractive proposition to nations which cannot afford complete specialisation. Known as the *Convertible Envoy*, this machine resembles the Envoy Series III in its general aerodynamic and structural design, but can be converted from civil to military equipment by four men in four hours. When used as a commercial aeroplane, the fittings for the military equipment are covered by the upholstery and thus hidden from sight. The normal arrangement in the civil form provides for the accommodation of six passengers.

When being converted into a military type, the cabin furniture is removed, with the exception of the forward port seat, which is retained for use by the navigator. The roof over the lavatory is removed and replaced by another section on which is mounted a revolving gun turret. A second machine-gun is installed on the starboard side of the fuselage.

In its civil form the Convertible Envoy has the same performance, with the same engines, as the Envoy Series III.

Airspeed, Ltd., The Airport, Portsmouth



The Airspeed Envoy III is normally powered by two Siddeley Cheetah engines of 350 h.p. each, but other makes can be fitted if desired. (*Flight* photograph.)

ARMSTRONG WHITWORTH

AT a time when the low-wing cantilever monoplane can be said to hold almost unchallenged sway, it is refreshing to come across a commercial aeroplane type in which the high-wing arrangement has been used. The Armstrong Whitworth Ensign class, type A.W.27, shares this feature with the Short Empire boats, so that when the fourteen on order have been delivered to Imperial Airways, that company will be operating more high-wing than any other types. One of the advantages of this wing arrangement is that all the passengers obtain a view of the ground below, whereas in the low-wing arrangement the wing cuts off a considerable proportion.

The *Ensign* is a large four-engined cantilever monoplane of all-metal construction. The fuselage is a metal monocoque structure, and the wing has the, by now, familiar Armstrong Whitworth corrugated box spar, to the back of which are attached the tubular ribs which are covered with fabric. In aerodynamic design the Ensign is characterised by a tapered wing of high taper ratio, while the fuselage is of very slender and graceful proportions. The nose projects a considerable distance ahead of the wings, so that the pilots obtain a remarkably fine view in all essential directions. It goes without saying that the machine is fitted with such modern adjuncts as retractable undercarriages and split trailing-edge flaps.

For use on the European and Empire air routes of Imperial Airways, two distinct styles of passenger accommodation are provided. When used on the European routes, the machine carries 40 passengers; on the Empire routes, where longer stages are flown and greater comfort is required, the accommodation is for 27 passengers by day and 20 by

night, with sleeping accommodation.

The division of the cabin space in the European type is: 12 in the front compartment, 4 in the card-room, 12 in the middle cabin and 12 in the aft cabin.

When fitted with four Siddeley Tiger IX engines of 880 b.h.p. each, the Ensign is designed to cruise at about 160 m.p.h. and to have a range of 500 miles against a 40 m.p.h. headwind.

Sir W. G. Armstrong Whitworth Aircraft, Ltd., Whitley, Coventry.

C-W

ONE of our youngest aircraft firms, C-W Aircraft, under the energetic leadership of Messrs. C. R. Chronander and J. I. Waddington, already has to its credit the smallest all-metal two-seater on the British market, the Cygnet, which will be found described on p. 516. Work is now progressing on a 6-7 passenger high-performance twin-engined type, which is to be known as the *Swan*.

This machine, which is in aerodynamic design of the popular modern twin-engined low-wing cantilever type with flaps and retractable undercarriage, has been stressed for taking power plants up to about 450 h.p. each, its performance depending on the power units used, but being in all cases of a high order.

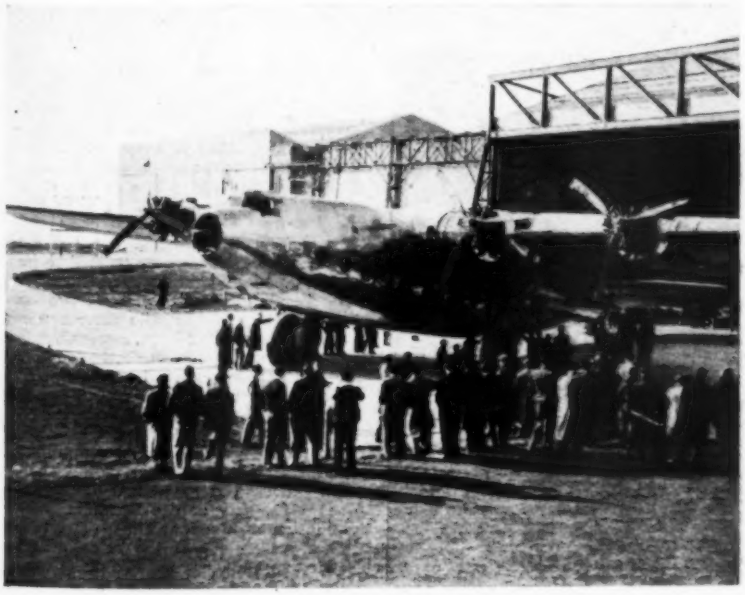
Passenger accommodation will be provided for six, with two seats side by side in the forward part of the fuselage for first and second pilot, or navigator, whichever is desired.

In its construction the fuselage is of fairly orthodox design, with formers, stringers and stressed-skin covering. A similar form has proved successful in the little Cygnet two-seater.

The wing construction is unusual and makes use of spar booms made up of circular-section tubes. To make the spar length everywhere proportional to the loads at the particular point, the gauge of the spar tubes is varied from root to tip, the inner portion being made up of five tubes inside one another, then four, then three, and so forth.

The Swan will, as already mentioned, be available with a range of power plants. In the least expensive form the machine will have Gipsy Six Series I engines; the cruising speed is then estimated at 165 m.p.h. With Series II Gipsy Sixes it is 175 m.p.h., and with Wright Whirlwinds or similar engines it is 225 m.p.h. The price provisionally fixed varies from £6,500 to £9,000.

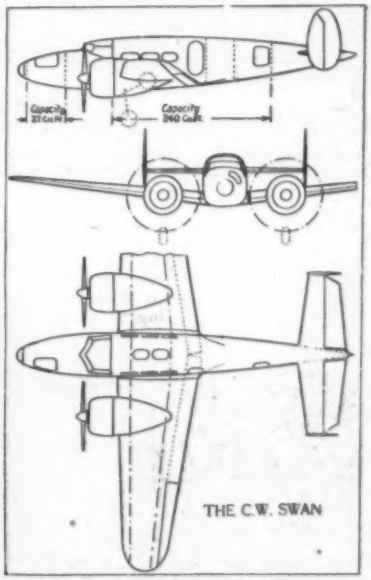
C-W Aircraft, Oxford Avenue, Trading Estate, Slough, Bucks.



The Armstrong Whitworth Ensign—the first of a large order for Imperial Airways—comes out for an engine run.

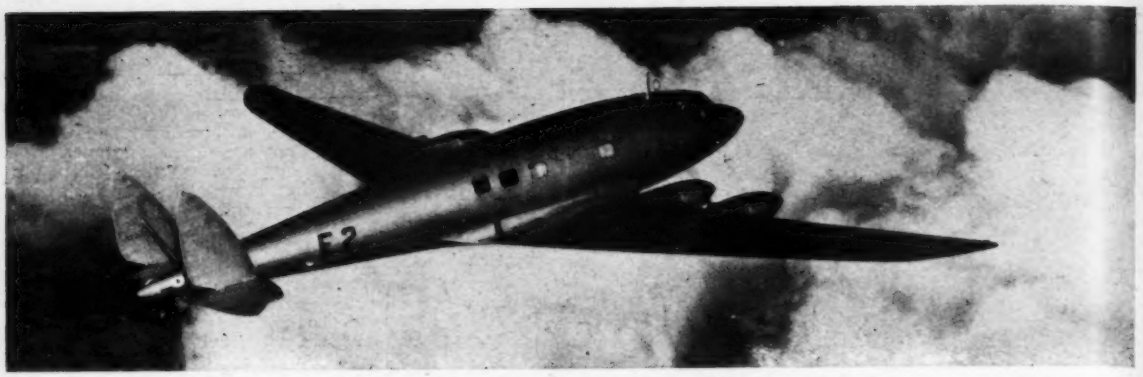
DE HAVILLAND

AS the firm which has specialised in civil aircraft ever since its inception, it is natural that a considerable range of



types are available from the De Havilland factory. The smaller are dealt with elsewhere (p. 517), including the Dragonfly, which can be looked upon as the heaviest D.H. type in the light class or as the lightest type in the heavy class.

With its two Gipsy Six engines of 200 h.p. each, the D.H.89 or *Dragon Rapide* is a very economical passenger and freight carrier with a disposable load of approximately 2,400 lb. and a cruising speed of 132 m.p.h. Payload and range can be



The first of the De Havilland Albatross inter-continental air liners on a test flight above the clouds. (*Flight* photograph).

varied within the limits of the disposable load and the weight of cabin equipment.

Nearly 150 Rapides have now been sold, and the type has almost become a standard light transport vehicle wherever subsidies are limited or mail contracts are worked at economical rates from the Post Office point of view. Numbers of Rapides are handling all the mail and much other transport work in Kenya, Rhodesia, Portuguese East Africa, and much of the local South African traffic. The machine is also extensively used in the Empire.

Next in size in the De Havilland range comes the *D.H.86 B.*, a four-engined biplane driven by 200 h.p. Gipsy Six, Series I engines. With its highly tapered wings and four inverted engines projecting from the lower wing, the 86 is a familiar sight at home and abroad.

With a cabin of average seating capacity and weight of furnishing, the 86 B has a disposable load of 4,000 lb. When 114 gallons of petrol are carried, the ultimate range is 450 miles and the pay load 2,184 lb. By increasing the fuel capacity to 191 gallons, the ultimate range is increased to 750 miles and the pay load is decreased to 1,555 lb. The cruising speed is 138-142 m.p.h. at a height of 1,000ft.

The *Albatross* is the 91st of the D.H. series and is a super-modern four-engined monoplane of highly refined aerodynamic design and unorthodox construction.

The D.H. 86 B (top) is fitted with four Gipsy Six engines of 200 h.p. each. (*Flight* photograph.) **In the lower picture is shown a Rapide flying in New Zealand.**

What immediately strikes one on looking at this machine is the remarkable thinness of the cantilever wing. In spite of the large size and span, the thickness at the wing root is very little greater than that normally found in much smaller aeroplanes. The object of the thin wing is, of course, to keep down profile drag, and it has been made possible by the unusual form of wing construction, which may be said to be a development of that first used in the De Havilland Comets which were produced for the England-Australia race, and one of which won that race.

In the fuselage also unorthodox forms of construction have been introduced. Details may not be divulged at present, but it can be said that the wooden monocoque shell combines the functions of structural member and sound-proofing. The exterior surface is glass smooth, with never a rivet to mar the surface.

Unorthodoxy is also found in the installation of the four Gipsy Twelve engines, which are of the 12-cylinder inverted air-cooled type. To make sure of obtaining adequate cooling while the engines are being run up, and while taxying, cooling air is taken in through openings in the leading edge of the wing and con-

ducted to the engine, these openings being so spaced that they receive the maximum of slipstream from the airscrew blades.

Particulars of the accommodation of the Albatross may not be given, but it has been stated that at any rate one of these machines is to be used for Atlantic flight experiments. It is also known that Imperial Airways have ordered five, which presumably will have accommodation for a considerable number of passengers. Performance figures have not been published, but it is estimated that the cruising speed will be in the neighbourhood of 200 m.p.h.

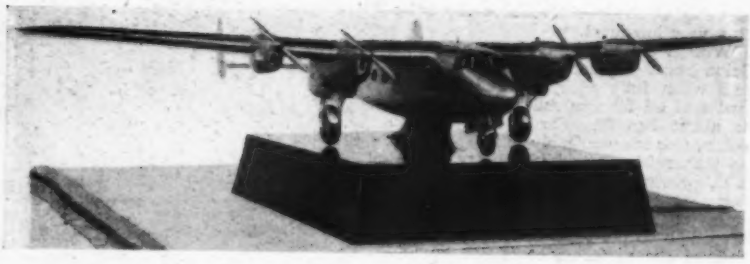
De Havilland Aircraft Co., Ltd., Hatfield, Herts.

GENERAL AIRCRAFT

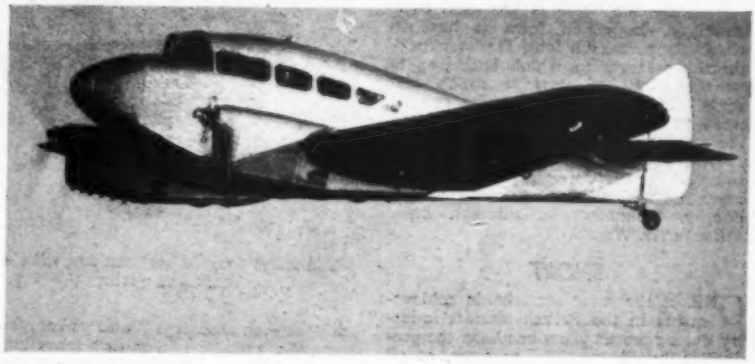
FROM the fact that they have been experimenting with a monospar machine fitted with tricycle undercarriage lately, it may be assumed that General Aircraft will be producing a new type incorporating this feature. This impression is strengthened by the fact that a model has been made, of which two pictures are shown on this page.

It will be noted that the General Aircraft model represents a high-wing monoplane, and undoubtedly there are many advantages in this arrangement. The engines are well clear of the ground, so that the fuselage can be brought down low, thus not only facilitating access to the cabin but making it a comparatively simple matter to retract all three wheels of the undercarriage. The resulting aeroplane is extremely clean and of pleasing appearance.

General Aircraft, Ltd., London Air Park, Feltham, Middlesex.



The shape of things to come may be foreshadowed by these photographs of a model with retractable tricycle undercarriage. (General Aircraft.)



The Miles Peregrine is fitted with two Gipsy Six engines. (*Flight* photograph).

PHILLIPS AND POWIS

SO far the largest type designed by Mr. F. G. Miles and built by Phillips and Powis, the *Peregrine*, is a six-passenger twin-engined low-wing monoplane of typical Miles "lines" and of wooden construction. The power plant fitted as standard is the De Havilland Gipsy Six, Series I or II, the latter, of course, with D.H. controllable-pitch airscrew.

In the cabin, which measures 12ft. in length, 4ft. 6in. in width, and 5ft. in height, the six seats are arranged along the sides with a central gangway between them. In the nose there are two seats with dual controls for the pilots.

The wing is of the two-spar type, covered with plywood. It is fitted with Miles type of flaps, normally operated by electricity, but with hand operation provided for emergencies. A trimming tab on the trailing edge of one aileron, and on rudder and elevator is controlled from the pilots' cabin.

Each unit of the retractable undercarriage consists of a pair of long-stroke oleo legs between which is carried a Dunlop wheel and two backwardly inclined cranked legs which, when "broken," raise the wheel aft into the tail fairing of the engine nacelle.

Mounted on welded steel tube bearers from the front spar, the Gipsy Six engines are started by electric starters operated from the cabin. The petrol and oil tanks are in the wing centre-section, just outside the fuselage.

In addition to the electrical equipment already mentioned, the *Peregrine* is equipped with navigation lights and interior cabin lighting, as well as with Harley retractable landing lights, so that the machine is serviceable for night flying.

In spite of the modest power expenditure, the *Peregrine* has a maximum speed of 180 m.p.h. and cruises at 160 m.p.h. The normal fuel supply suffices for a duration of 2¾ hours at this speed. The disposable load is 2,500 lb.

Phillips and Powis Aircraft, Ltd., Woodley Aerodrome, Reading.

POBJOY

ALTHOUGH originally purely an aero engine firm, this company now also manufactures aircraft, a start being made with the Short Scion, a small all-metal high-wing twin-engined monoplane designed specially for feeder line and similar work, where economy of operation is a major consideration.

The Pobjoy-Short *Scion* normally has seating accommodation for five passengers, but an additional seat can be fitted, making seven in all with the pilot's. The Pobjoy Niagara III engines are very quiet in themselves, and sound-

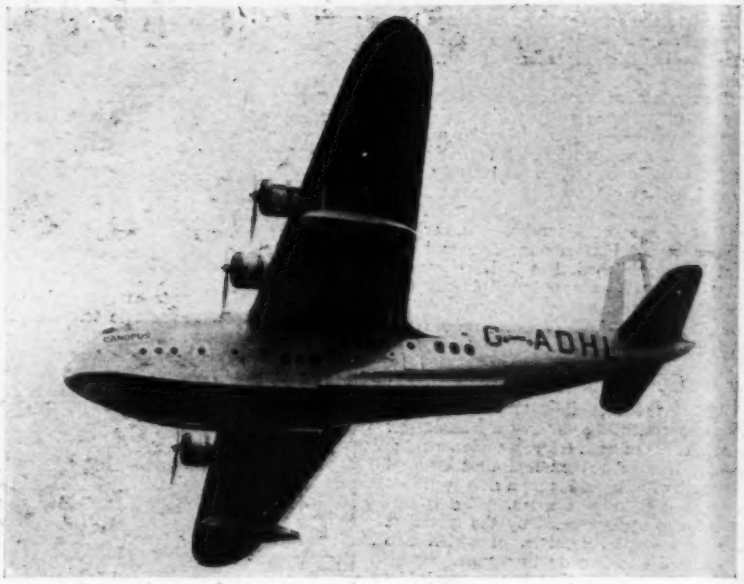
The Pobjoy-Short Scion carries up to six passengers on two Pobjoy Niagara engines of 90 h.p. each. (*Flight* photograph.

proofing of the cabin reduces the noise to a very low level.

With a gross weight of 3,200 lb. the Scion has a disposable load of 1,280 lb., and when fully equipped and carrying fuel and oil for 400 miles the pay load is about 840 lb. For a total of 180 b.h.p. this is remarkably high, especially as the cruising speed is 110-115 m.p.h. The makers claim that the Scion can be operated at a profit for 1s. per aircraft mile, or 4d. per passenger mile when loaded to 60 per cent. of its pay load.

That the performance is not by any means bad in spite of the fairly high power loading is shown by the fact that the take-off run is 140 yards and the sea level rate of climb 625 ft./min.

Normally the Scion is produced as a landplane, in which form it has its wheels supported on long Dowty shock-absorbing struts in which springing is provided by coil springs inside the struts. If desired, the machine can be fitted with twin floats of Short design. The seaplane version carries a somewhat smaller pay load for the same range, owing to the extra weight of the floats as compared with the wheel undercarriage. *Pobjoy Airmotors and Aircraft, Ltd., Rochester, Kent.*



The Short Empire boat is fitted with four Bristol Pegasus Xc engines rated at 740 h.p. each and giving 910 h.p. for take-off. (*Flight* photograph).

SHORT

ONE of the most remarkable achievements in the British aircraft industry during recent years has been the production by Shorts, of Rochester, of all but one or two of the 28 flying boats of the Empire class originally ordered by Imperial Airways for the England-Africa and England-Australia air routes. At a time when most other firms were a long way behind with their orders, Shorts were producing slightly ahead of schedule and at the rate of one flying boat every two weeks.

The *Empire* class of flying boat is a four-engined high-wing monoplane of all-metal construction, powered by four Bristol Pegasus Xc engines of 740 rated b.h.p. each and developing 910 b.h.p. for take-off. The accommodation in the hull is unusual in that it is arranged on two floors, of which the lower is devoted entirely to passengers while the upper contains the pilots' and navigator's compartments, mail hold, and stowage space for bedding, etc.

Comfort of a very high order is provided and includes such luxuries as a smoking-room and a promenade, so that even on a very long flight the travellers can " stretch their legs " and go forward for a quiet smoke. For day travelling there is accommodation for 24 passengers, while at night there are sleeping berths for 16. In addition to the complement of passengers there is available a considerable carrying capacity for mails, although it is conceivable that when mail loads become really heavy the number of passengers may have to be reduced unless extra machines can be put into service.

Structurally the Short Empire flying boats are interesting because of the simple hull construction, in which the curved chines of earlier models have been suppressed, and on account of the ingenious wing construction, with a single girder box spar having T-section corners. The petrol tanks, which are shaped rather like a cheese, are housed inside the wing, and no fuel whatever is carried in the hull.

The Bristol Pegasus engines are carried on streamline monocoque mountings springing forward from the front of the wing spar, and with the long-chord engine cowls forming nacelles of low drag. Gill cooling flaps are fitted. The machine cruises at 160 m.p.h.

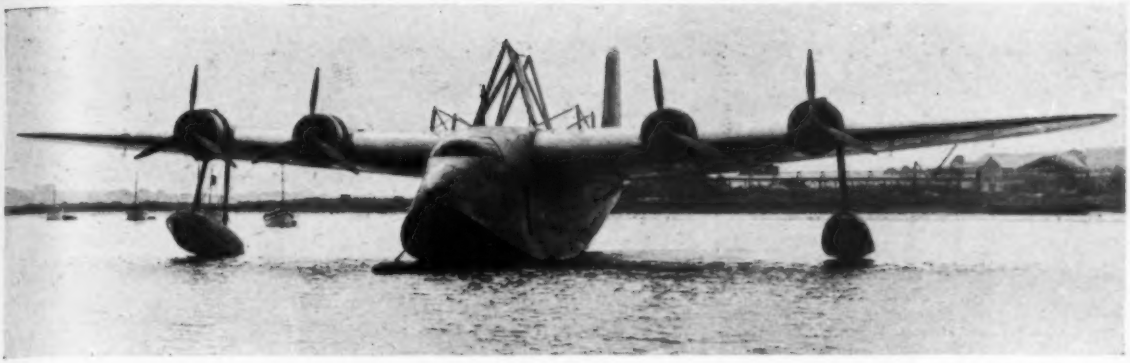
A very interesting experiment is due to be made any day now. This is the first flight of the Short-Mayo *Composite* aircraft, in which a large, lightly loaded flying boat, generally similar to the Empire class, assists a smaller but heavily loaded twin-float seaplane to operational height by carrying it on its back. The two machines, when secured together, form virtually an eight-engined biplane. The upper component is so heavily loaded that it would not be able to get off the water under its own power.

The *Maia*, as the lower component of the composite aircraft is named, resembles the Empire flying boats in its general lay-out, but the wing area has been considerably increased (1,750 sq. ft. compared with 1,500 sq. ft.) so as to keep wing loading down to a reasonable figure when the upper component is being carried. The ailerons also are larger, as they have to control the entire combination, and the outboard floats are larger because of the greater metacentric height of the composite.

When used for assisting the take-off of the upper component the Maia will, of course, carry no other pay load, and the amount of fuel will only be that necessary for the take-off and climb, with a certain reserve for emergency. When so loaded the Maia weighs approximately 25,000 lb. The performance is nearly the same as that of the Empire boats.

Mercury is the name given to the upper component of the composite aircraft. This machine is a twin-float seaplane fitted with four Napier-Halford Rapier engines of about 320 h.p. each. The machine, which is of all-metal construction, is extremely " clean " aerodynamically, as proved by the fact that the cruising speed is in the neighbourhood of 190 m.p.h. For a twin-float seaplane of but 1,360 total b.h.p. this figure

***Mercury*, the upper component of the Composite, has four Napier Rapier engines of 320 h.p.** (*Flight* photograph.)



The lower component of the Composite supports the upper on a trestle which incorporates the hook release gear. (*Flight* photograph.)

is unusually high. Had the machine been a landplane with retractable undercarriage it would have been much higher still, but Imperial Airways wanted a floatplane with a view to operation over the southern route, there being no aerodromes in the Azores.

The *Mercury* has been designed to carry a mail load of 1,000 lb. across the Atlantic against a headwind of 40 m.p.h. average velocity. There is little doubt that it will do so with a safe margin.

A very economical miniature air liner produced by Short Brothers is the *Scion Senior*. This machine is a high-wing cantilever monoplane developed from the Scion, which it resembles in its general lines. It is, however, a four-engined type, and thus combines the economy of small size and low power with the safety-factor introduced by splitting the total power into four separate units. The engines are Pobjoy Niagaras of 90 h.p. each, and with only 360 total h.p. the Scion Senior carries up to ten passengers at a cruising speed of 125 m.p.h.

The machine is also available as a twin-float seaplane. The total loaded weight is the same in both cases, 5,750 lb., but the load available for pilot and passengers is reduced, in the seaplane, from 1,560 lb. to 1,190 lb., the difference representing the extra weight of the floats. A Scion Senior seaplane was sold to the Irrawaddy Flotilla Company a couple of years ago for use in the East.

Short Brothers (Rochester and Bedford), Ltd., Rochester, Kent.

With four Pobjoy Niagara engines of 90 h.p. each the Short Scion Senior carries up to ten passengers. The machine is available both as a landplane and as a seaplane. (*Flight* photograph.)

CIVIL TRANSPORT MACHINES

Machine.	Engine(s).	Total Max. H.P.	No. of Passenger Seats.	Span.	Length.	Weight Empty.	Weight Loaded.	Max. Speed.	Cruising Speed.	Ceiling.	Normal Cruising Range.
				ft. in.	ft. in.	lb.	lb.	m.p.h.	m.p.h.	ft.	miles.
Airspeed Envoy III	Siddeley Cheetah IX (2)	700	6	52 4	34 6	4,341	6,600	203	170	23,000	620
Airspeed Convertible Envoy (Civil).	Siddeley Cheetah IX (2)	700	6	52 4	34 6	4,341	6,600	203	170	23,000	620
Armstrong Whitworth Ensign	Siddeley Tiger IX (4) ...	3,180	40	123 0	110 6	—	—	200 (approx.)	160 (approx.)	—	500 (40 m.p.h. wind.)
C-W Swan	D.H. Gipsy Six II (2) ...	410	6	46 0	36 0	3,600	6,000	205	175	—	700
De Havilland Albatross ...	D.H. Gipsy Twelve (4)...	2,200	—	105 0	71 6	—	—	—	210	—	—
D.H. 86 B	D.H. Gipsy Six I (4) ...	800	10-16	64 6	46 1½	6,250	10,250	166	142	19,500	450-750
D.H. 89 A Rapide	D.H. Gipsy Six I (400)...	400	5-10	48 0	34 6	3,230	5,500	157	132	16,700	573
Miles Peregrine	D.H. Gipsy Six II (2) ...	420	6	46 0	32 0	3,200	5,700	180	160	23,000	—
Pobjoy Short Scion	Pobjoy Niagara III ...	190	6	42 0	31 6	1,920	3,200	130	115	13,000	—
Short Empire Flying Boat ...	Bristol Pegasus XC (4)...	3,160	24	114 0	88 0	24,000	40,500	200	165	20,000	760
Mayo Upper Component ...	Napier Rapier V (4) ...	1,020	—	73 0	50 11½	—	21,000	—	185 (approx.)	—	4,000 (approx.)
Mayo Lower Component ...	Bristol Pegasus X ...	3,660	—	114 0	84 11	—	25,000 (approx.)	—	—	—	—
Short Scion Senior landplane...	Pobjoy Niagara III (4)...	380	9	55 0	42 0	3,652	5,750	145	126	14,000 (approx.)	420
Short Scion Senior seaplane ...	Pobjoy Niagara III (4)...	380	9	55 0	42 0	4,058	5,750	135	120	11,000 (approx.)	400

Small, but Vital

AS yet the electric accumulator plays only a minor part in the whole make-up of the aeroplane—minor in bulk, but not in function, of course.

At a recent tour of the Manchester works of the Chloride Electrical Storage Co., Ltd. (Exide), this matter of sheer bulk was brought home last week to those who were present. Alongside the enormous submarine batteries (10 cwt. per 2-volt cell), the vehicle-traction batteries, the massive house-lighting equipments, and so on, the small aero batteries for radio and lighting purposes, appear almost negligible. But a feature of Exide methods is that all these accumulators are made by the same processes from the same raw materials.

THERE and BACK

The Fine Croydon-Cape-Croydon Flight of F/O. Clouston and Mrs. Kirby-Green in the D.H. Comet : 14,700 Miles at 189 m.p.h. Average

FOLLOWING so magnificent a flight as that achieved by F/O A. E. Clouston and Mrs. Kirby-Green in the De Havilland Comet it is difficult to know which to praise first, the skill and endurance of the pilots or the faultless behaviour of the aeroplane and engines.

Though recognising that the figures should not be "officially" compared, it is interesting to observe that the out-and-home journey to the Cape, taking 5 days 17 hours 28 minutes from Croydon to Croydon, did not merely clip a matter of hours off the existing record set up by Mr. H. L. Brook, but no less than 3 days 16 hours 2 minutes. On the outward trip, as reported fully in *Flight* last week, the Comet, now called *The Burberry*, set up a new record of 45 hours 2 minutes, this being 1 day 9 hours 24 minutes better than Miss Amy Johnson's time. Then, on the return journey, a record time of 57 hours 23 minutes was achieved, 1 day 14 hours 57 minutes better than Mr. H. L. Brook's figure.

Large sections of the flight were made by night, and praise is due for the very great navigating skill displayed. Landings were made using only the large Harley light in the Comet's nose, aided in some cases by the moon.

On the return journey the pilots were showing signs of fatigue, although they experienced better weather. Some of the high-altitude aerodromes in Central and South Africa had made take-off with big loads of fuel more difficult, and at Cairo the Comet was put down only on the third attempt, owing, it is understood, to dazzle from the instrument panel lights.

The arrival at Croydon at 3.23 on the afternoon of Saturday, November 20, was triumphal if not so rowdy as on previous occasions. A large force of police and a long wait in the cold had thinned the crowd to a safe number of friends and enthusiasts.

A short history of the Comet's previous successes appeared in *Flight* last week. Since the Istres-Paris-Damascus race in August the very full wireless equipment (including generator and convertor) has been removed, giving a weight saving of 190 lb.

In its original form the Comet had two Gipsy Six R engines, but for these were recently substituted two Standard Gipsy Six Series II engines with 1,000-size D.H. v.p. airscrews. The use of v.p. airscrews is almost essential on a machine combining speed and range. The all-up weight in this case is increased by about 1,000 lb., which means an added 1,300 miles in range, while the cruising speed is improved by 12 per cent., roughly the difference between 190 and 210 m.p.h.

The fuel capacity is a little more than in the original form—123 + 108 + 25 gallons, with an additional 8 making 264—sufficient for 13 hours or 2,800 miles.

When the Series II engines were fitted, under the direction of Mr. R. J. Cross, of Essex Aero, Ltd., a modification of the cowlings was necessary to suit the spinners of the 1,000-size v.p. airscrews. Other modifications include an additional Vickers' fuel tank vent in the cockpit where it could not ice-up as in the Damascus race, and strengthened shock-absorber units to stand up to the increased loading. The extra vent proved essential on certain sections of the trip when ice formed very quickly and the engines showed signs of getting starved.

	Arrival Time.	Departure Time.	Flying Time.	Time on Ground.	Total Time.	Distances.	Total Distance.	Speeds.
			hr. min.	hr. min.	hr. min.	miles.	miles.	m.p.h.
Croydon ...	(Nov. 14)	9.55 p.m.	—	—	—	—	—	—
Cairo	8.59 a.m.	10.05 a.m.	11 4	1 6	12 10	2,300	2,300	208
Khartoum.	3.19 p.m.	10.30 p.m.	5 14	7 11	24 35	1,050	3,350	201
Broken Hill	9.08 a.m.	9.45 a.m.	10 38	37	35 50	2,200	5,550	207
Johan'burg	2.08 p.m.	2.37 p.m.	4 23	29	40 42	850	6,400	194
Cape Town	6.57 p.m.	—	4 20	—	45 2	800	7,200	185
Cape Town	(Nov. 18)	6.00 a.m.	—	—	—	—	—	—
Johan'burg	9.55 a.m.	10.35 a.m.	3 55	40	4 35	800	8,000	206
Broken Hill	2.55 p.m.	11.25 p.m.	4 20	8 30	17 25	850	8,850	196
Kisumu ...	6.12 a.m.	6.45 a.m.	6 47	33	24 45	1,070	9,920	161
Khartoum.	1.50 p.m.	2.10 p.m.	7 5	20	33 10	1,300	11,220	184
Cairo	7.43 p.m.	12.28 a.m.	5 33	4 45	42 28	1,050	12,270	189
Marseilles .	11.20 a.m.	11.45 a.m.	10 52	25	53 45	1,800	14,070	166
Croydon ...	3.23 p.m.	—	3 38	—	57 23	620	14,690	172

Six thermos flasks for beef tea, brandy and milk, etc., and Moseley "non-surging" cushions added comfort to the trip, and a little room in the nose for a change of clothes, food, spares and papers was greatly appreciated.

During the whole flight there were only two slight mishaps. On the outward journey a delay of 7 hours occurred, due to trouble in getting permission to take off, and on the return a delay of 8½ hours occurred at Broken Hill while small adjustments were made and further "permissions" were obtained.

Flying Officer Clouston specially praised the Wakefield organisation, which gave valuable aid on the flight. Among the detailed items of equipment which played their part in securing the success were :—

The D.H. Comet : Smith's air-speed indicator, altimeter and oil pressure, oil temperature, boost and petrol pump gauges, rev. counters and watch ; Reid and Sigrist turn and bank indicator ; Sperry artificial horizon and directional gyro ; Kollsman sensitive altimeter ; Weston intake thermo-couples and oil temperature gauges ; Short and Mason and Husun compasses ; Harley landing lights ; Teleflex M.R.C. controls ; Dagenite batteries (Peto and Radford) ; Superflexit oil piping ; Petroflex petrol piping ; Vickers petrol cock ; Dunlop tyres ; Bendix brakes ; Cellon finish ; British Aluminium tanks and cowlings ; Renolds and Accles and Pollock steel tubing ; Rumbold upholstery ; small parts by Brown Bros. (Aircraft) Air Materials and Mosers ; Skefko ball races for undercarriage ; Hoffman ball races for controls.

The D.H. Gipsy Six Engines : D.H. v.p. airscrews ; High Duty Alloys and Sterling Metals piston forgings ; Motor Components valves ; Sterling Metals Elektron castings for rocker boxes and crankcases ; Mills alloy cylinder heads ; Salter's valve springs ; English Steel Corporation crankshaft ; Hoyt white metal bearings ; Eyre Smelting Company's steel-backed bearings ; High Duty Alloys connecting rods ; B.T.H. magnetos, K.L.G. bottom-seating plugs ; Hobson carburettors ; Autoklean filter ; Rotax starter ; British Insulated Cables and B.T.H. cables ; Coopers and Hall and Hall gaskets ; Wellworthy piston rings ; Rotax vacuum pump ; Amal flame trap and fuel pump ; Pinchin Johnson paint ; Simms couplings ; Esso fuel ; Wakefield Castrol oil

The Crew wore Burberry flying kit.

Short Bros. Results

THE annual report of Short Bros. (Rochester and Bedford), Ltd., shows that the trading profit for the year, including income received from royalties and commissions, was £133,976, against £86,714. After deducting the increased provision for taxation the net profit is £98,026, against £75,971.

A total share distribution of 40 per cent. was recently announced.

WING LOADING

R.Ae.S. Lecture Gives Rise to an Interesting Discussion

THAT wing loadings a great deal higher than those now in use are, theoretically, feasible, and that the benefits they will confer are such as to make the necessary development well worth while, emerged not only from the lecture given last Thursday to the R.Ae.S. by Mr. H. F. Vessey, but from the discussion which followed it. The first part of the lecture was published in the Aircraft Engineer section of *Flight* last week.

MR. R. FEDDEN was in the chair, and had the slight misfortune to have to request the audience, on the instigation of the lecturer, to refrain from discussing that part of Mr. Vessey's paper which dealt with tricycle landing gears. It was felt that discussion of this subject should be deferred until after the lecture to be given by Sqn.-Ldr. Frazer shortly. Mr. Fedden wanted information about the placing of the airscrews when wing loadings as high as those contemplated by the lecturer came into use.

MAJOR R. E. PENNY, of the Air Ministry, thought the flying-boat had come off badly in the paper and did not appear quite to agree with the lecturer. He would like to know the relative efficiency of the flying boat and the comparable landplane for the Atlantic range. He pointed out that by using assisted take-off the flying boat could be designed for the landing condition loading only; this would result in a reduction in the size of the hull, which could be made of good aerodynamic form. The metacentric height would become almost positive in a large flying boat, so that the outboard floats could be made small and possibly retractable.

An Early Discovery

DR. GUSTAV LACHMANN, of Handley Page, Ltd., criticised the lecturer's formula for optimum wing loading and wrote alternative formulæ on the blackboard; these, he said, gave similar results but brought out the physical meanings more clearly. He recalled that many years ago Dr. Lanchester discovered that the best L/D ratio was obtained when matters were so arranged (as regards aspect ratio, etc.) that the induced drag was equal to the rest of the drag.

DR. ROXBEE COX, of the Royal Aircraft Establishment, was disappointed that the lecturer had not attempted to include the weight effect of aspect ratio quantitatively in his paper. He knew it was difficult, but felt the weight effect was greater than inferred in the paper.

He thought that the tendency, with increase in aircraft size, was for the " density " to remain constant. That meant high wing loadings. In the flying wing there were no practical limits to size as the load would be distributed. The lecturer had stated that aircraft designers differed in their views on aspect ratio, those used ranging from six to ten. Personally, he leant strongly towards the "6 school." With low aspect ratio there were better facilities for putting the load inside the wing.

One thing that puzzled him in the paper was the distinction between take-off and landing, much being made of " designing for the landing only." When a flying boat was taking off it frequently bounced, and the return to the sea was actually a landing. He thought that possibly some simple physical meaning had escaped him in the lecturer's reference to the Bolas-Goodman Crouch use of airscrews with their axes tilted downwards.

MR. D. L. HOLLIS WILLIAMS, of General Aircraft, expressed the view, as a result of his experience with the tricycle undercarriage, that its main advantage was in giving more rapid acceleration during the take-off. There were several reasons for this, one being the fact that the wings were at a small incidence, and, therefore, small drag, during the run.

DR. H. C. H. TOWNEND, of the N.P.L., agreed with Dr. Roxbee Cox about the downwardly inclined airscrew axes. He could not see that this could make any real difference, and thought it sounded like trying to lift one's self by one's bootstraps.

MR. BELLARD said that he could answer for the lecturer concerning Dr. Lachmann's reference to maximum L/D ratio. The optimum was obtained at the maximum L/D of the wing only, and not at the maximum L/D of the whole aircraft.

FLT.-LT. P. W. S. BULMAN, of Hawker Aircraft, was surprised at the difficulties indicated in the paper concerning landings. He had always thought the take-off was the difficult thing, not the landing. If the lecturer was right, it should be much easier to provide arrester gear than accelerators on an aerodrome.

MR. NIGEL NORMAL, of Airwork, Ltd., regretted that the question of the effect of high wing loading on operating cost was not included in the paper. On the subject of runways he recalled that the figures given by Mr. Vessey agreed fairly well with some he had given in a paper about a year ago. He thought aerodromes with 1,200 yards run would derive great benefit from runways. Already aerodromes were being planned which gave runs of 2,000 yards. He suggested the possibility of using runways for part of the distance only. That was being done at the Berlin aerodrome.

CAPT. FRANK T. COURTNEY thought that when, in a few years, all the advantages of high wing loadings and assisted take-offs were being used to the full, they would look back to Mr. Vessey's paper and say that was the first big gun fired in the campaign. He pointed out that the length of run required varied inversely as the acceleration, so that the runway length depended on how large acceleration could be tolerated. He expressed the opinion that there were several ways in which one could approach an examination of the many variables involved. The lecturer had apparently taken a given aircraft and cut down wing size. He (Capt. Courtney) some time ago took a standard aeroplane, leaving area constant, and increased the power to keep the induced drag the same.

MR. P. P. NAZIR thought his cut slot could answer all the demands put forward in the paper.

MR. W. E. GRAY was surprised that Mr. Vessey still stuck to the old-fashioned way of thinking in terms of rate of climb, when it was really angle of climb that mattered. He did not follow the lecturer's explanation of landing technique with three-wheeled undercarriages. He could see no reason why one could not make a crash-landing just as well on an ordinary undercarriage as on a tricycle.

MR. VESSEY, in replying to the discussion, regretted the fact that many of the audience were disappointed at being deprived of the opportunity to discuss tricycle undercarriages, but thought it would be better to defer the subject until after Sqn.-Ldr. Frazer's lecture, when he (Mr. Vessey) would be present and promised to assist with any replies needed.

He could not tell Mr. Fedden where one would place the airscrews in the highly-loaded large aircraft of the future. The airscrew problem was going to be difficult, but he had shown in his paper that by making a small sacrifice in cruising speed efficiency, a great increase in take-off thrust could be obtained. He did not agree with Major Penny that take-off thrust was not important with assisted take-off. It was because of the *angle* of climb (with a bow to Mr. Gray) after take-off.

Dr. Roxbee Cox had expressed himself in favour of the low aspect ratio and thought the machine would be faster. He did not agree. With small aspect ratio one got a large root chord. This meant increased interference between wing and fuselage and hence increased drag.

He thought there might be something in Mr. Nigel Norman's suggestion for concrete runways over part only of the distance. Superficially, one would say that the concrete should be at the beginning of the run, but he was not certain that was necessarily so.

"FLIGHT" and the BRITISH AIRCRAFT INDUSTRY.

THIS Special Number of "Flight" is mainly devoted to the British civil and military aircraft industry. Next week, Dec. 2, other important aspects of aircraft production will be reviewed in an equally comprehensive manner in the second of our two Special BRITISH AIRCRAFT INDUSTRY numbers:

ENGINES and EQUIPMENT

Modern British aero engines will be described and graphically illustrated, and performance data tabulated. In the equipment section, the productions of some 300 firms will be reviewed.

THURSDAY, DECEMBER 2 — FLIGHT — **SIXPENCE AS USUAL**

To avoid disappointment a definite order should be placed with your newsagent.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE FIRST "TRICYCLES"

IT is possible that some of your readers may not recall the fact that the Antoinette aeroplane, which began to fly in 1908, had its wheels behind the centre of gravity and was fitted with a forward skid, producing much the same result as the present tricycle undercarriage.

My first monoplane, in 1911, was similarly balanced. On one occasion, to avoid a collision on Brooklands Aerodrome (of which, at that time, only a small space was cleared and levelled), it was necessary to make a sudden landing. The pilot forced the front skid into the ground, pulling the machine up in about 60 feet and thus avoiding an accident. It was quite a normal landing, and the pilot taxied in.

Owing to general criticism of this type of undercarriage, it was, unfortunately, dropped. It proved an efficient brake, prevented nosing over and was not unduly heavy.

London, W.C.2. L. HOWARD-FLANDERS, A.F.R.Ae.S., A.M.I.Mech.E., M.R.S.T.

RADIO FOR THE PRIVATE OWNER

MR. JOHN CARR'S letter [p. 468, November 11] voices the desires of quite a number of private owners who are interested in radio equipment and regard it as a potential help.

In this case Mr. Carr seems to have progressed beyond the usual stage of talking vaguely about "radio as an aid to flying" by making a definite suggestion that the ultra short-wave band of 4 to 5½ metres might be used for private aviation services. Any constructive suggestion is worth investigating, and, even if we have to abandon it, some useful lesson may be learnt.

The main advantage of the 900-metre system, as used at present, is that it satisfies the two requirements for which radio equipment is fitted to an aircraft, viz. (1) Communication, and (2) Navigational assistance.

A comparatively simple transmitter and receiver does both jobs with the assistance of the ground direction-finding stations. The shortcomings of the present system are well known and need no elaboration here, the worst feature being the radio traffic congestion under bad weather conditions. It is therefore clear that the privately owned aircraft is not going to be allowed to make matters worse confounded.

Unfortunately the art of short-wave direction-finding is not yet sufficiently far advanced for a ground station system for the aeronautical services to be standardised. Hence, although the short waves or ultra-short waves may be employed for communication purposes they cannot form, at present, a direction-finding channel.

There are one or two snags about using very short wavelengths for aircraft radio work, one of which is that the range is not quite so limited as supposed at first. The three 9-metre Lorenz installations near London (Heston, Gatwick, Croydon) have all had to be set up on different frequencies to avoid mutual interference, and the strength of reception seems to be proportional to the height at which the aircraft is flying. This latter effect may be very awkward if a pilot is forced right "down on the carpet" and wants to establish communication with his terminal aerodrome.

Mr. Carr tells us that it is "possible to buy aircraft installations costing about £50." It is not clear from his letter whether this refers to a transmitter-receiver installation or to a receiver alone. Experience has shown that for aircraft operation, with its attendant vibration and other electrical variables, first-class design and workmanship must be put into any equipment, and particularly into a short-wave apparatus. For stability of transmission crystal control must be used, and such details as insulators must receive special attention for use at very high frequencies.

Therefore any equipment meeting such special requirements and selling at a reasonable price will create unusual interest.

One point apparently overlooked by Mr. Carr is the bonding and screening necessary for good reception at these frequencies. Good results from the 9-metre Lorenz receiver entirely depend on the amount of care taken in the installation and the maintenance of the screening and the bonding system, which, in itself, is likely to be an expensive luxury, easily absorbing another £50 in the case of a machine like a Vega Gull. It is to be hoped that in the course of time the aircraft and engine manufacturers will turn out their standard products fully bonded and screened, as the cost will be about halved when the work is done during the construction of the aircraft.

Assuming that the above troubles can be overcome, the private pilot may find himself with his own two-way system which can be used for sea crossings and obtaining weather reports on demand. It seems, however, that it will be quite a long time before he can use the same equipment for navigational aid, i.e., to obtain bearings.

On the other hand, there are now available medium-wave direction-finding receivers (which can also be used for "homing") so that reception of Borough Hill met. reports is possible, bearings of that station obtainable, and also bearings of all broadcasters and beacons from 200 to 2,000 metres. The new air radio beacons shortly going into service all over Europe will prove extremely valuable to both airline and private pilots as taking some of the load off the aerodrome D/F stations.

The self-contained D/F receiver is also of particular interest to private owners touring abroad, as the foreign broadcasting stations are easily identified without the language difficulty.

Summarising the above, it would appear that at the present moment the private owner of the small aircraft must content himself with a D/F receiver. For the immediate future, he may have to choose between this and the two-way communication set on a special wave-length, according to the value he sets on the service obtainable from either type of equipment. The last stage would be the ideal state where a simple transmitter and receiver can be used for communication and direction finding. It may be a long time before this ideal is reached, but in the meanwhile, it would be of general interest if, through the medium of your columns, amateur pilots would state their preference for plain two-way communication or direction-finding receivers for use on their aircraft.

London, N.W. H. W. SAMUELSON.

[In his weekly comments "Indicator" has gone into the possibilities of the short-wave two-way set for the private owner, but has rather tended towards the conclusion that a really good D/F or homing receiver is the present answer to his needs. This would be used in conjunction with the Borough Hill and other broadcast stations and with beacons which might, or might not, be specially arranged for the private owner in years to come.

It is interesting to find that Mr. Samuelson, who has had a long experience of aircraft radio installation, follows the same line of reasoning. He deals with the whole subject in a usefully constructive and knowledgeable way. Perhaps the private owners' hopes of radio assistance are not quite so forlorn as some people imagine.—ED.]

DEFENCE BY SMOKE-SCREEN

YOUR correspondent, Mr. H. R. Dimock, asks whether smoke-screen defences to protect towns from bombing attack, have been thought of before. While I have no doubt that M. Blump did something of the sort in his Bleriot XXXVIII at least thirty years ago, there has been an example of its use recently—the Italian Air Force, I believe, having employed this method of protection for important towns during exercises.

The method used is not the dangerous one of dropping smoke bombs (the civil population might object to that), but the comparatively safe one of spraying it, in the same way as sky-writing, I presume. This form of defence was featured in a film about the Italian Air Force, called, I think, "The Blue Hangar."

Would not the machines be better employed in shooting up enemy aerodromes? And why not use ground equipment, from the tops of towers?

The bombing scare could be stopped simply by dividing the average number of first-line bombers into the number of towns and big villages in Britain. It would probably work out at one bomber available per town! The only objection is that the manufacturers of bomb-proof materials and long-handled shovels might be out of pocket and the Government out of a vote-catching scheme. A. MCKEE.

Southsea.

FLIGHT NEXT WEEK: 2nd Special British Aircraft Industry Number: *Engines and Equipment*

British Military Aircraft

Current Types Reviewed : Superlative Performance of New Fighters and Bombers : Aerodynamic and Structural Advances

BRITAIN'S aerial strength during the next two or three years will be dependent, in the main, on the following aircraft types: the Hawker Hurricane and Supermarine Spitfire fighters; Hawker Henley light bomber; Bristol Blenheim, Fairey Battle, Vickers Wellesley and Wellington and improved Handley Page Hampden medium bombers; Handley Page Harrow and Armstrong Whitworth Whitley heavy bombers; and the Westland Lysander army co-operation machine. This list represents "first-line" equipment and excludes Fleet aircraft, trainers and what may be termed "utility" types.

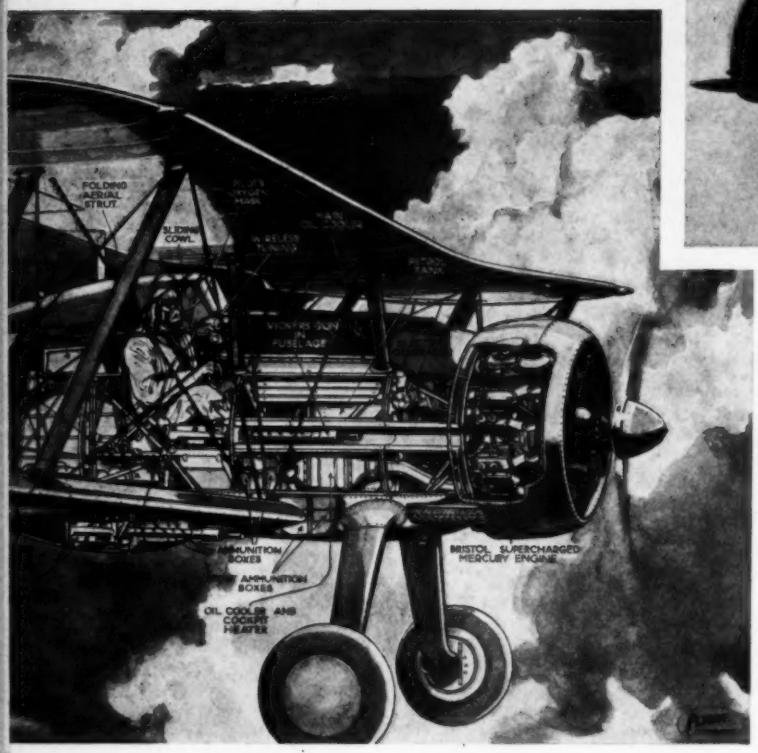
Since *Flight* last reviewed the range of British military aircraft comparatively few prototypes have appeared; the past twelve months have been marked chiefly by the introduction of new bombing equipment into Royal Air Force squadrons. The aircraft concerned are at least as good as their counterparts abroad; in fact, many of our production machines are the equal of, and even superior to, comparable foreign prototypes.

Hereafter current types of British military aircraft will be discussed under the headings of their various categories. Brief data relating to most of the engines mentioned will be found on the last page of this section.

FIGHTERS

ROYAL AIR FORCE fighter squadrons are armed at the moment with Hawker Furies, Gloster Gauntlets, Gloster Gladiators or Hawker Demons (all these types, in one form or another, have been exported) and are awaiting the issue of Hawker Hurricanes and Supermarine Spitfires. The types mentioned, with the addition of the Gloster F.5/34 and Vickers

Capable of over 300 m.p.h., the Hawker Hurricane single-seater day-and-night fighter is fitted with the Rolls Royce Merlin II engine. The formation of the radiator housing is interesting.



The four-gun Gloster Gladiator is seen in detail on the left. Above is a *Flight* photograph of one of these machines as supplied to Finland.

Venom prototypes, make up the current range of British fighters.

The Gauntlet is a two-bay metal biplane with fabric covering fitted with the Mercury VIS radial and equipped with two fixed belt-fed guns, two-way wireless, night-flying gear and four 20lb. bombs. At 15,800 ft. the top speed is 230 m.p.h.; the climb to 20,000 ft. takes 9 min., and the service ceiling is 35,500 ft.

Similar in general proportions and construction to the Gauntlet, the Gladiator has a more powerful engine (Mercury IX), a single-strut undercarriage with Dowty internally sprung wheels, and four Browning guns (two being mounted on the lower main planes), trailing edge flaps, and a cockpit enclosure.

At 15,000 ft. the Gladiator does 246 m.p.h. The climb to 20,000ft. takes half a minute longer than for the Gauntlet, and the service ceiling is about 2,500ft. lower. With flaps down the landing speed is 50 m.p.h.

Gloster's latest fighter is the F.5/34, a low-wing cantilever monoplane with metal covering, retractable undercarriage, v.p. airscrew, Mercury or Perseus engine, cockpit enclosure, and a tail in which the fin and rudder are set well forward on the fuselage.

Details of the armament and equipment are withheld, but the machine is intended for day and night operation.

Dimensions of the F.5/34 are: Span 38ft. 2in. length 32ft. and height 10ft. 2in. and the wing area is 230 sq. ft.

The Hawker Fury, with periodic rejuvenation, has enjoyed a particularly long run of popularity. It appeared in 1929 fitted with the Rolls-Royce Kestrel engine and since that date performance has been stepped-up not only by fitting more powerful models of Kestrel (alternatively various other British and foreign power plants) but by adopting a cleaner form of undercarriage. The most recent Fury design has a single-strut landing gear with internally sprung wheels and uses the Kestrel XVI engine, which gives a speed of about 250 m.p.h.

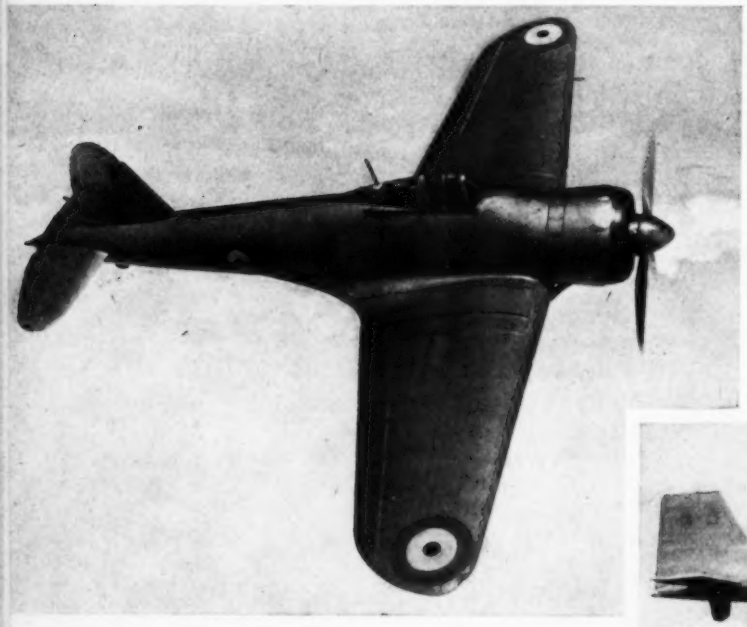
Successor to the Fury in the range of Hawker fighters is the Hurricane (built to specification F.36/34) with Rolls-Royce Merlin II engine. A metal fabric-covered cantilever low-wing monoplane with flaps and retractable undercarriage, the Hurricane does over 300 m.p.h. with a formidable armament load, the nature and extent of which may not be revealed. The machine is equipped for day and night operation and carries wireless.

The undercarriage retracts laterally, the wheels making a slight rearward motion to clear structural members of the wing. Panels, moving with the wheels, cover the wheel wells during flight.

Peculiarities of the Hurricane include the scoop-shaped air intake and a radiator housing of similar formation. The radiator is well back under the fuselage, in what is known by the Rolls-Royce technicians as the ventral position. A fixed-pitch wooden airscrew is used.

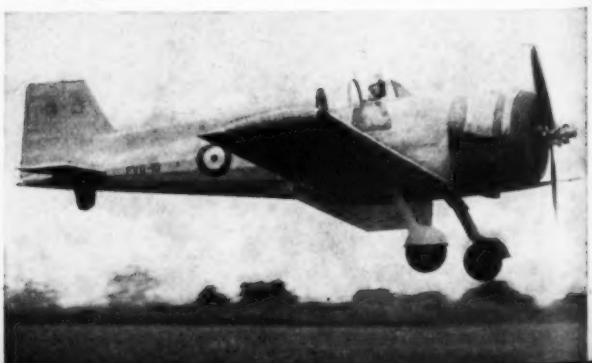
A pair of orientable landing lights is installed within the wing, being provided with transparent covers shaped to follow the contour.

The Hawker company has supplied to the R.A.F. a large number of Demon two-seater fighters. The Demon is a member of the Hart family and is normally powered with the Rolls-Royce Kestrel V



The shapely Gloster F.5/34 is characterised by an unusual tail in which the fin and rudder are placed well forward.

Built as a private venture to the same specification as the Gloster, the Vickers Venom (below) has an Aquila sleeve-valve engine.



A Hawker Demon two-seater fighter fitted experimentally with a Nash and Thompson power-driven gun mounting. (*Flight* photograph.)

engine. Armament comprises two fixed guns, a free gun and a small bomb load and a speed approaching 200 m.p.h. is attained when the machine is carrying its full equipment, including wireless and night flying gear.

The success of the Demon is indicated by the large numbers in service (many were built by Boulton Paul under sub-contract) so it will not be surprising if replacement types appear before very long.

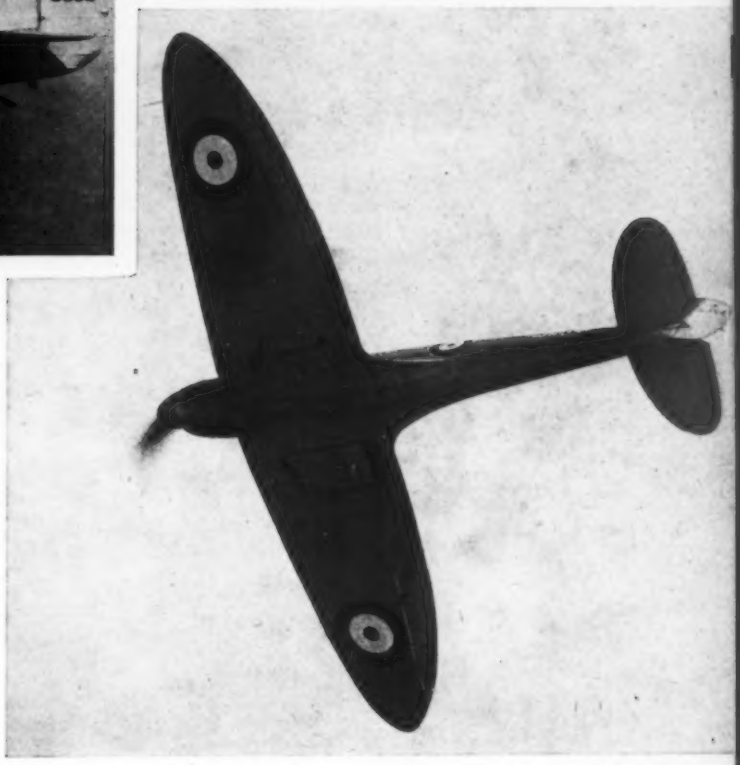
As supplied to Australia, incidentally, the Demon is virtually a general purpose machine with a supercharged engine (Kestrel V). This version is equipped not only for light bombing, but carries army co-operation gear, including a message hook.

To Supermarines goes the credit for building the fastest of all Great Britain's fighters—the Spitfire with Rolls-Royce Merlin II engine. A day-and-night fighter monoplane of exceptionally clean design, the Spitfire typifies the latest Supermarine technique in stressed-skin application. It is claimed that the particular form of construction used gives a stiffness to wings and fuselage never before attained in this class of aircraft. The surface is perfectly smooth.

The undercarriage of the Spitfire retracts laterally into the wings. A fixed-pitch wooden airscrew is fitted to the Merlin engine which utilises ducted radiators located beneath the wings and not under the fuselage as is normal.

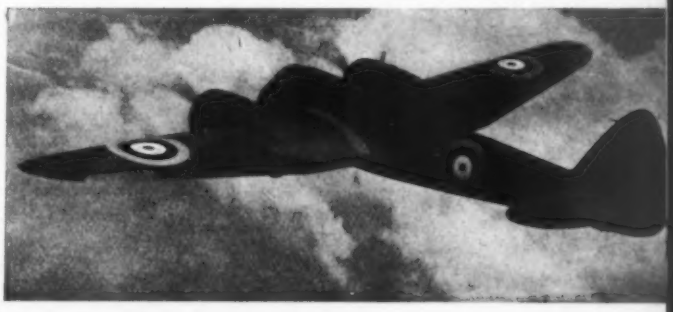
Despite the extreme speeds attained, the Spitfire has marked powers of manœuvre as demonstrated at the R.A.F. and S.B.A.C. displays. There is a distinct possibility that a special version of the Spitfire may be used in an attempt to secure for this country the world's speed record for landplanes.

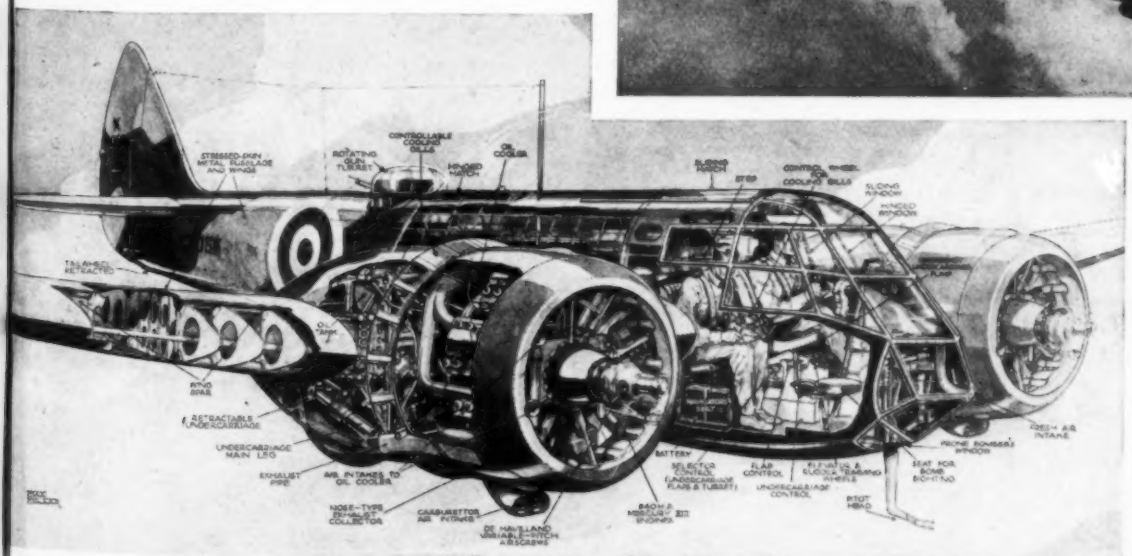
Vickers (Aviation), Ltd., have made an interesting approach to the problems connected with the design of a modern single-seater fighter. Their Venom monoplane is comparatively small and uses an engine (the sleeve-valve Bristol Aquila) of considerably lower power than the Merlin in the Hurricane and Spitfire. Square-cut surfaces are characteristic of the Venom. The undercarriage retracts electrically, the flaps have an unusually wide range of movement and the cockpit is liberally provided with windows. A D.H. v.p. airscrew is employed.

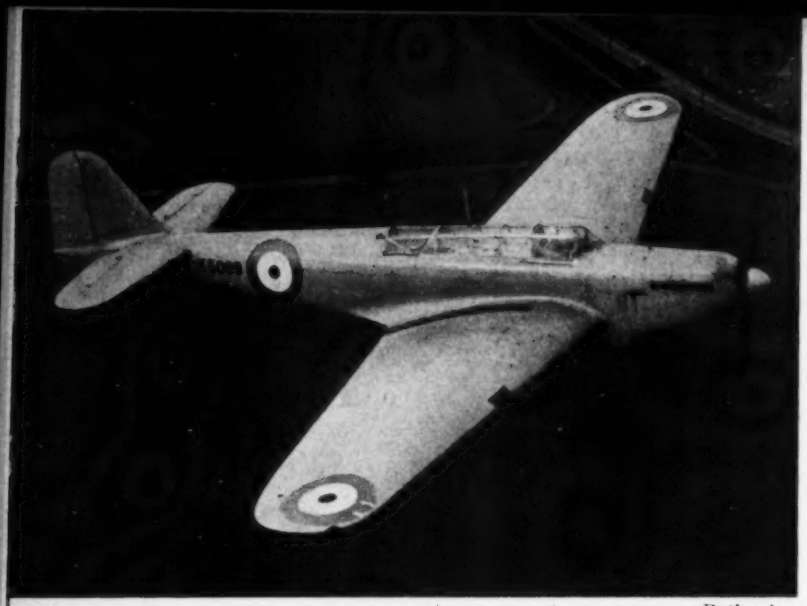


The classical beauty of the exceptionally fast Merlin-powered Supermarine Spitfire single-seater fighter is revealed to great advantage in this view. Note the ducted radiators beneath the wing.

The cut-away drawing of the Bristol Blenheim medium bomber reveals not only the comprehensive equipment but the power plants (Mercury VIIIs). The *Flight* photograph shows its external shape.





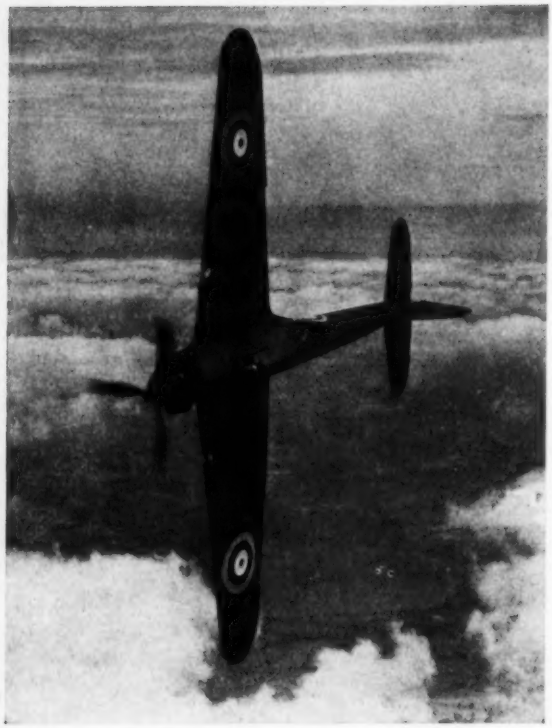


Surely one of the most beautiful two-seaters ever built, the Fairey P.4/34 light bomber has a Rolls-Royce Merlin II engine and carries its bombs externally. (*Flight* photograph.)

LIGHT AND MEDIUM BOMBERS

SECRECY regulations, and the apparent infidelity of the R.A.F. to a system of class nomenclature, makes definition of the terms "light" and "medium" bombers somewhat difficult. The following is a rough and ready explanation: The light bomber is a very fast two-seater capable of making diving attacks with a bomb load of at least 500 lb. Rather heavier loads (1,000 lb. or more of bombs) are handled by the "mediums" which are variously single- or twin-engined. Single-engined machines in this category are normally capable of making dive-bombing attacks. The larger types of twin-engined medium bombers carry bomb loads comparable with those specified for the heavy bombers of a very short while ago. Their speed is greater, their crew fewer and their range rather shorter than is the case with current heavy bombers.

The present standard type of light bomber used by the R.A.F. is the Hawker Hind biplane with Rolls-Royce Kestrel V compositely cooled engine. Developed directly from the Hart design, the Hind, in its most recent "export" form, is fitted with the Kestrel XVI engine and does over 200 m.p.h. Successor to the Hind is the Henley monoplane, built to Specification P.4/34 and standardised by the Service. Performance figures, with the Rolls-Royce Merlin II engine, are still secret, although some estimate of the top speed may be made when it is known that the Fairey Battle, considerably larger and heavier, but similarly powered, does something like 260 m.p.h.



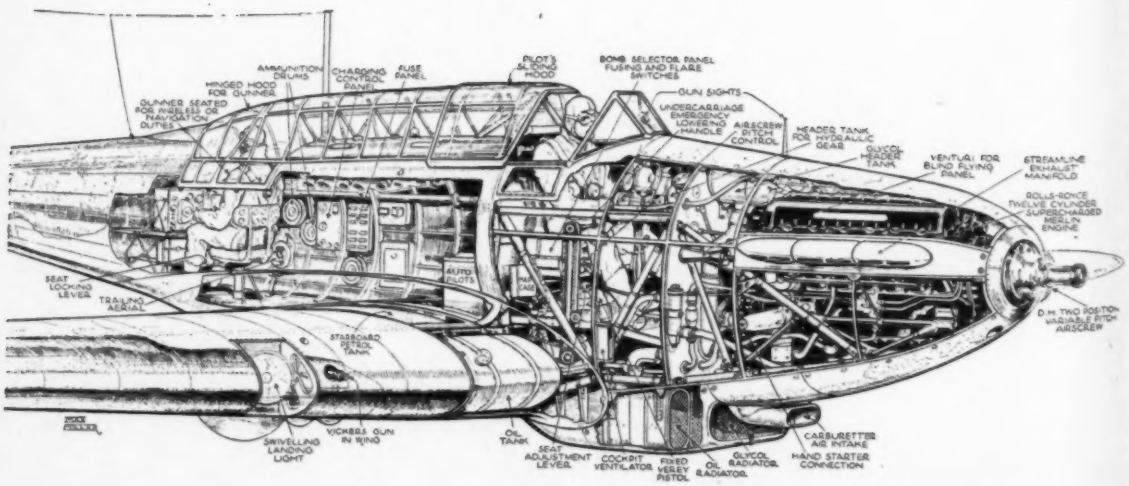
A *Ducted Radiator*

The Henley's Merlin drives a three-bladed De Havilland v.p. airscrew and is provided with a nose-type ducted glycol radiator, the tunnel for which blends into the fuselage belly, wherein the main bomb load is stowed. It is known that, under certain conditions, bombs can be slung from faired carriers below the wing. Pilot and observer are accommodated in a shapely enclosure, the rear portion of which, as so far seen in public, may be a temporary structure.

The bomb compartment below the wing results in the mid-wing effect as now being sought by many designers on aerodynamic grounds. Flaps are included, of course, and the undercarriage retracts completely.

Likewise built to the P.4/34 specification, the Fairey light

The manœuvrability of the Fairey Battle is indicated in the *Flight* photograph on the left, and the complexity of its equipment in the *Flight* copyright drawing below.



Pegasus XX engines were specified for the Handley Page Hampden prototype shown here. An improved version is in production with Napier E.108s.

bomber (Merlin II) is metal-skinned (the Henley is fabric-covered) and is a fine example of flush riveting. Bombs are carried externally, and consequently it has been possible to keep the frontal area of the fuselage very low. Manœuvrability is of an extremely high order. The Fairey's radiator is of the ducted "mid-ventral" type.

Actually completed some time before the P.4/34, the Fairey Battle medium bomber already equips at least two R.A.F. squadrons and is in large-scale production not only at the Fairey Company's Stockport works but in the Austin "shadow factory." Features are: Rolls-Royce Merlin II with mid-ventral ducted radiator, an undercarriage which, when retracted, leaves segments of the wheels protruding, bomb cells with retractable carriers in the wings, two machine guns, automatic pilot and full night-flying gear. A crew of two or three may be accommodated.

Data relating to the Battle are: top speed 257 m.p.h. at 15,000 ft.; range at 200 m.p.h., 1,000 miles at 16,000 ft.: climb to 15,000 ft. 13 min. 36 sec.; service ceiling 25,000 ft.; landing speed 60 m.p.h.; wing loading 25.6 lb./sq. ft.

A second type of single-engined medium bomber now being issued to R.A.F. squadrons is the Vickers Wellesley constructed on the Vickers-Wallis geodetic principle, which utilises curved diagonal members. Built in the first instance as a private venture to a "general purpose" specification, the Wellesley may be used as a torpedo carrier or long-range bomber, the bombs being stowed in external streamlined containers. The Pegasus engine (normally Series XX in the machines now in production) drives a D.H. v.p. airscrew.

navigator, pilot, and wireless operator-gunner. A fixed gun (Vickers or Browning) is carried in the port wing and there is a free gun in the power-driven gun turret which is partially retractable. The main bomb load is stowed in the lower portion of the fuselage.

Bristol long-chord cowlings with nose exhaust collector rings and cooling gills are fitted over the Mercury engines. The undercarriage retracts into the nacelles, hydraulically operated jacks "breaking" the radius rods at the knee joints.

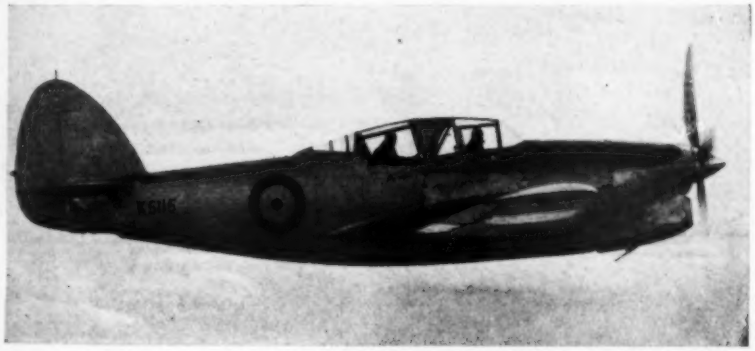
Provision has been made for dual control. The forward and downward view from the pilot's cockpit is quite exceptionally good.

Additional data for the Blenheim are: Take-off run, 330 yards; weight empty, 7,409 lb.; weight loaded, 12,030 lb.; wing area, 469 sq. ft.

Rather larger than the Blenheim, the Handley Page Hampden and Vickers Wellington each have outstanding characteristics; the Hampden has Handley Page slots and slotted flaps, and the Wellington is of geodetic construction.

The production version of the Hampden, being built at the Short and Harland factory in Belfast, is planned to take a pair of the new Napier E.108 24-cylinder Daggers, which will drive constant-speed D.H. airscrews.

The manufacturers claim that the high,



The Hawker Henley light bomber (Specification P.4/34) is powered with the Rolls-Royce Merlin II and carries its main bomb load in ventral compartments. Additional bombs may be attached outboard. (*Flight* photograph.)

Great aerodynamic and structural efficiency, due to the system of geodetic construction employed, makes the Vickers Wellesley a most formidable long-range bomber. Pegasus X, XVII and XX engines have been specified.

Flaps, completely retractable undercarriage and separate cockpit enclosures for pilot and air gunner are features. The following performance data apply to the Wellesley as powered with a Pegasus engine with two-speed supercharger: top speed 228 m.p.h. at 17,000 ft.; absolute ceiling 32,500 ft.; landing speed 54.5 m.p.h.; take-off run 306 yard range (at 10,900 lb. A.U.W.), 1,325 miles at 197 m.p.h.; range (at 12,500 lb. A.U.W.) 2,270 miles at 186 m.p.h.; climb to 17,000 ft. 17.9 min.

Probably the most publicised bomber of the past two years, the Bristol Blenheim, with two Mercury VIII engines, has an outstanding performance. Not only the top speed—280 m.p.h. at 15,000 ft.—but the splendid rate of climb—20,000 ft. in 13 min.—put the Blenheim in the very front rank of military aircraft, and fit the machine for a variety of uses.

As a bomber, the Blenheim has a crew of three—bomb aimer-

The Pegasus-powered Vickers Wellington I prototype. Production versions of this extremely efficient medium bomber are likely to differ in certain respects.

Adopted by the R.A.F. as the standard type of bomber transport, the Bristol Bombay has medium supercharged Pegasus engines. Despite the fixed undercarriage and the demands of the specification, the performance is excellent. (*Flight* photograph).

narrow fuselage helps to keep down the total drag of the machine without impairing the stowage space in the fuselage or interfering with the disposition of the gunners' cockpits (nose, top fuselage and bottom fuselage). This feature also enables the engines to be mounted close together, giving good control and stability. The deep, narrow fuselage portion does not extend for the entire length of the machine, but in the region of the rear cockpits develops rather abruptly into a rear section, or boom, of very small cross section.

The Vickers Wellington has a fuselage which has been likened to a baby airship. Of excellent shape it has a gun turret in the nose and the tail and a third mid-way along the fuselage. The engines in the prototype were Bristol Pegasus, but no announcement has yet been made regarding the power plants of the production version. Depending on the work to be undertaken, the crew consists of four or seven men.

Although out of production, the Boulton Paul Overstrand, which equips No. 101 (Bomber) Squadron, R.A.F., is worth inclusion in this section because it was really the first twin-engined medium bomber to see service. The manœuvrability, judged by any standards, was of an exceptionally high order, and the performance, in comparison with contemporary machines, was quite outstanding.

HEAVY BOMBERS AND BOMBER TRANSPORTS

THE past year has seen the entry into service of the Handley Page, Harrow and Armstrong Whitworth Whitley heavy bomber monoplanes and the passing into quantity production of the Bristol Bombay bomber transport. Previous standard bombers were the Handley Page Heyford biplane and Fairey Hendon monoplane. With two Kestrel VIs the Heyford does 142 m.p.h. and the Hendon, similarly powered, is capable of 152 m.p.h. at 15,000 ft. Additional figures for the Hendon are: climb to 10,000 ft., 15 min.; service ceiling, 19,100 ft.; landing speed, 58 m.p.h.; disposable load, 7,554 lb.

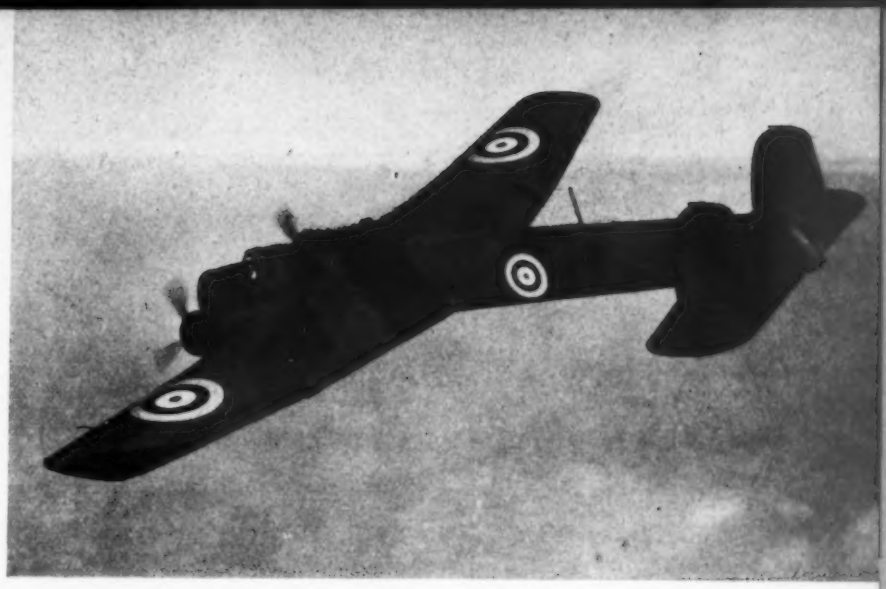
The Harrow is a high-wing cantilever monoplane covered with metal and fabric. Originally the use of a retractable undercarriage similar to that on the Hampden was contemplated, but closer scrutiny of the problems of heavy bombing led to the conclusion that no sufficient advantage would be gained in performance and that the added complication and weight would not be adequately repaid.

Armament comprises five machine guns. There is a Nash-and-Thompson-powered turret with twin Lewis guns in the extreme nose and tail and a third position on top of the fuselage. The bomb load, considerably heavier than that specified for previous Service types, is stowed internally in the fuselage bottom.

The makers claim that the latest slotted wing equipment enables the Harrow to be operated with abnormal loads from small aerodromes and confers a wide speed range.

Data for the Harrow II (Pegasus XX engines) are: top speed at 10,000 ft., 200 m.p.h.; cruising speed at 15,000 ft., 163 m.p.h.; range with normal bomb load, 1,250 miles; maximum range, 1,840 miles; all-up weight, 23,500 lb.

Leading-edge slots and slotted trailing-edge flaps characterise the 200 m.p.h. Handley Page Harrow heavy bomber, supplied to the R.A.F. in two forms—Marks I and II—fitted respectively with Pegasus X and XX engines. Six guns are carried. (*Flight* photograph.)



Capable of well over 200 m.p.h. when powered with Siddeley Tiger VIIIs, the Armstrong Whitworth Whitley heavy bomber is well defended, having machine guns in the nose and tail and below the fuselage. The Nash and Thompson turrets (nose and tail) were not fitted when this photograph was taken. (*Flight* photograph.)

The Armstrong Whitworth Whitley conforms more to accepted modern ideas in the construction of long-range bombers (i.e., it is a mid-wing, metal-covered cantilever monoplane with retractable undercarriage) although its lines have a striking individuality. The latest version of the Whitley (Mark III) has Nash and Thompson turrets in the nose and tail and a third gun position in the bottom of the fuselage. Bombs are stowed in cells in the fuselage and in wing compartments.

Although the first batches of Service Whitleys are fitted with two Siddeley Tiger IX engines (medium supercharged) subsequent machines will have Tiger VIIIs with two-speed superchargers.

Figures for the Whitley powered with Tiger IXs are: tare weight, 14,275 lb.; normal all-up weight, 21,660 lb.; top speed, 192 m.p.h. at 7,000 ft.; cruising speed, 160 m.p.h. at 15,000 ft.; service ceiling, 19,200 ft.; range, 1,250-1,600 miles.

The Bristol Bombay (Type 130) bomber transport is a high-wing all-metal monoplane with two medium-supercharged Pegasus engines and a fixed undercarriage. It has been planned for troop-carrying, bombing and general transport duties. A crew of four is carried when the Bombay is used as a bomber; when twenty-four fully armed troops are accommodated the crew is three.

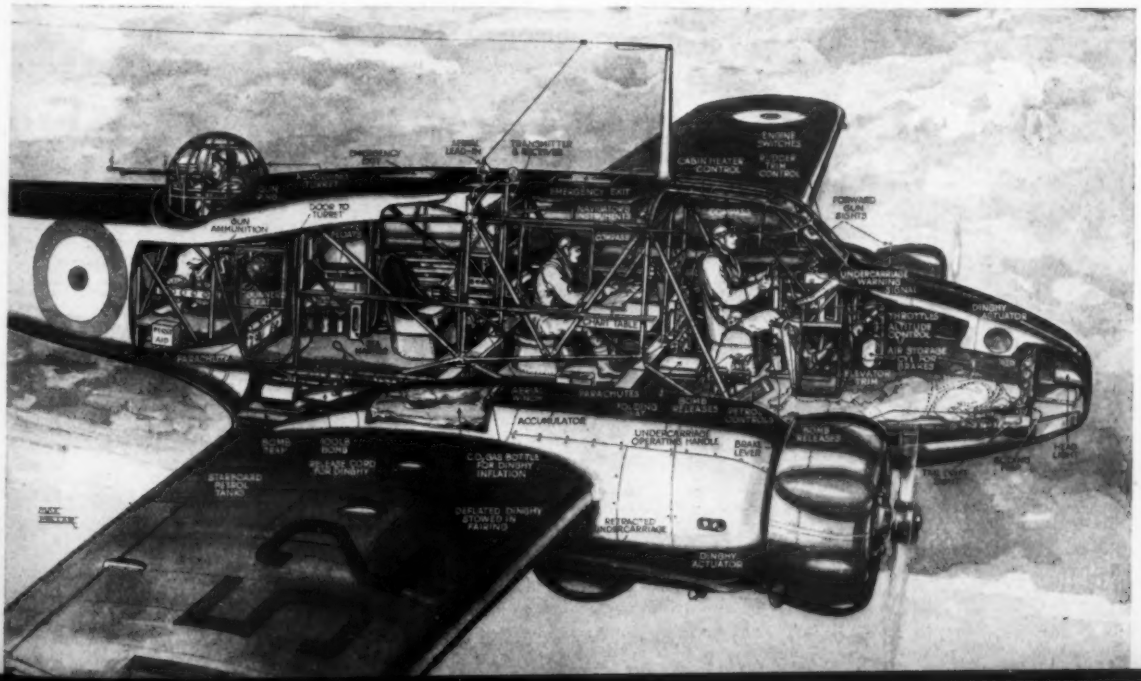
Dimensions are: span, 96 ft.; length, 67 ft. 9 in.; height, 16 ft.

GENERAL RECONNAISSANCE

THE first, and so far, the only, general reconnaissance machine to be adopted by the R.A.F. is the Avro Anson, a twin-engined low-wing monoplane with a wooden wing and a welded steel-tube fuselage. A retractable undercarriage is fitted, the wheels, when raised, being partially "buried" in the nacelles, which carry the two Siddeley Cheetah IX radials driving fixed-pitch Fairey airscrews. Flaps are fitted to the latest model.

Armament comprises a fixed Vickers gun for the pilot and a Lewis gun in an Armstrong Whitworth turret on top of the fuselage. Internal stowage is provided for two 100 lb. bombs

Used by the R.A.F. for general reconnaissance and advanced training duties, the Avro Anson, a Swedish version of which is seen in action on the right, is sectioned below to show some of the military equipment. (*Flight* copyright drawing.)



Completely slotted and flapped, the Westland Lysander army co-operation monoplane (Mercury XII or Perseus VIII engine), is in large-scale production for R.A.F. units. (*Flight* photograph.)

The first Service type to mount the 24-cylinder Napier Dagger engine, the Hawker Hector army co-operation machine is a development of the Kestrel-engined Audax. (*Flight* photograph.)

and up to eight 20 lb. bombs. As the Anson, as supplied to the R.A.F., is intended for operation over the sea, the commodious cabin houses a great variety of special marine equipment.

Essentially the Anson is a versatile general-purpose machine and it has been exported to meet a number of differing requirements.

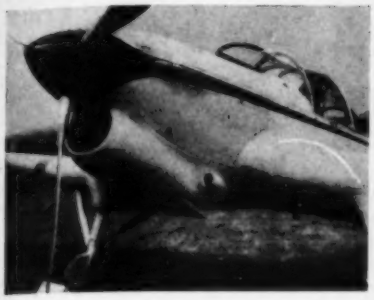
Data are: maximum permissible gross weight, 8,000 lb.; top speed, 188 m.p.h. at 7,000 ft.; service ceiling, 21,400 ft.; climb to 5,000 ft., 6.1 min.

ARMY CO-OPERATION

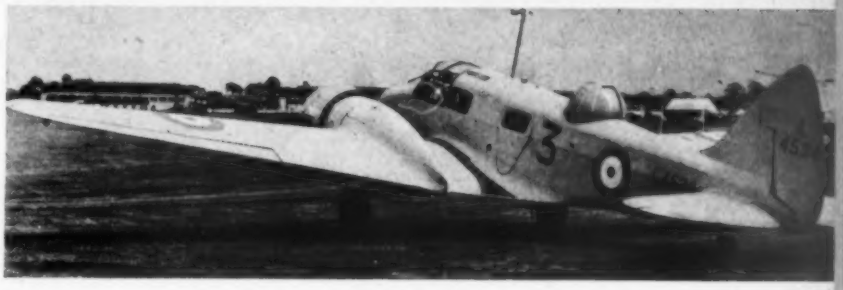
APART from a small number of Westland Wapitis still remaining there are two types of army co-operation machine now in service with the R.A.F. Both are basically similar, but the earlier model—the Hawker Audax—has the Rolls-Royce Kestrel X engine, whereas the newer Hector mounts the 24-cylinder Napier Dagger III. The Hector also differs from its predecessor in that it has no sweep-back on the top planes; it has a "cut-away" rear cockpit and improved equipment. The maximum speed approaches 200 m.p.h. at the comparatively low heights at which army co-operation machines normally work. Armament comprises a fixed gun and one free gun.

Before long it is intended to equip several units with the Westland Lysander monoplane, which is undoubtedly the most

The R.A.F. is but one of many military air services employing the versatile De Havilland Tiger Moth trainer. The engine is the Gipsy Major. (*Flight* photograph).



On the right is the shapely Miles Kestrel trainer with, above, a close-up of the installation of the Rolls-Royce Kestrel XVI. (*Flight* photograph.)



The Airspeed Oxford is destined for the training of R.A.F. personnel in advanced flying and the use of equipment. It has two of the new Cheetah X engines. (*Flight* photograph.)

advanced army co-operation machine in existence. The braced wings are of single-spar construction and are fully slotted and flapped, the operation of the flaps being entirely automatic. Other characteristics are an excellent all-round view from the enclosed cockpits, a fixed undercarriage with internally sprung wheels, and landing lights in the wheel fairings, Bristol Mercury XII or Perseus VIII engine and D.H. v.p. airscrew.

It is claimed that the Lysander can be taken off from, and land on, a football pitch and that the flying qualities are such that the machine will stand a great deal of mishandling and abuse.

Dimensions of the Lysander are: span, 50 ft.; length, 30 ft.; height, 11 ft.

GENERAL PURPOSE

THE "G.P." machines of the R.A.F. have earned a name for exceptional versatility coupled with fine performance. Normally, they are officially categorised as light bombers, although the Vickers Wellesley, dealt with in the appropriate section as a medium bomber, is an exception. Types in service at the moment are, the Fairey Gordon (Siddeley Panther IIa), Hawker Hardy (Kestrel X), Westland Wapiti (Jupiter VIIIF), Westland Wallace (Pegasus IIM), and Vickers Vincent. The Vincent is a development of the Vildebeest torpedo bomber and is fitted with a medium supercharged Pegasus engine. Equipment includes Army co-operation gear, desert rations, two guns, and a formidable bomb load.

TRAINING

THE new types park at the last R.A.F. Display, and the S.B.A.C. Display featured a number of new training machines, designed for the schooling of pilots and crews in the operation of up-to-date, high-performance military aircraft. Three of the types concerned—the Miles Magister, De Havilland Don and Airspeed Oxford—are the subjects of large-scale production orders from the Air Ministry.

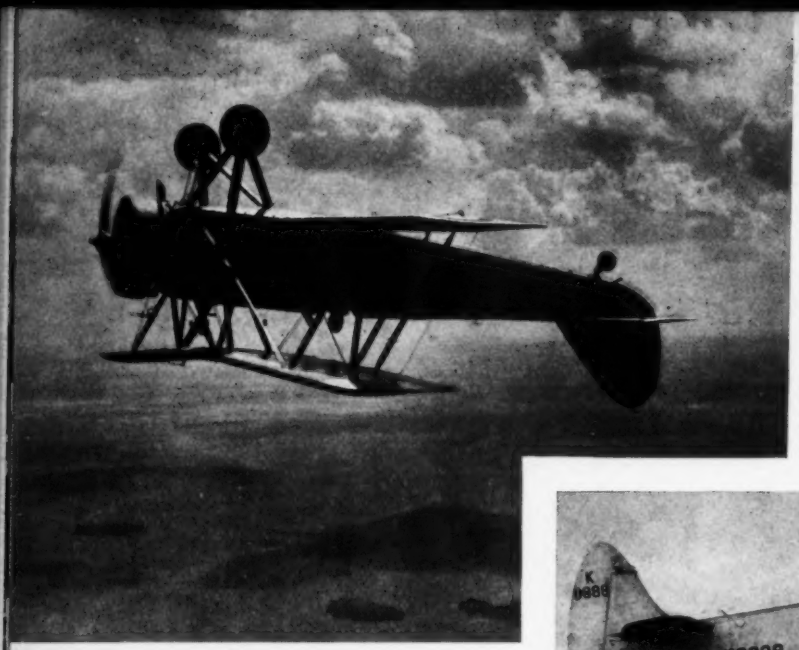
A development of the Hawk series, the Magister, is a wooden, low-cantilever-winged two-seater with a fixed single-strut undercarriage and trailing-edge flaps. The engine is the D.H. Gipsy Major, which gives a top speed (at 1,825 lb.) of 145 m.p.h. Landing speed, take-off run and landing run (with flaps and brakes) are, respectively, 45 m.p.h., 70 yds. and 100 yds. Complete dual controls and instruments and a blind-flying hood are specified.

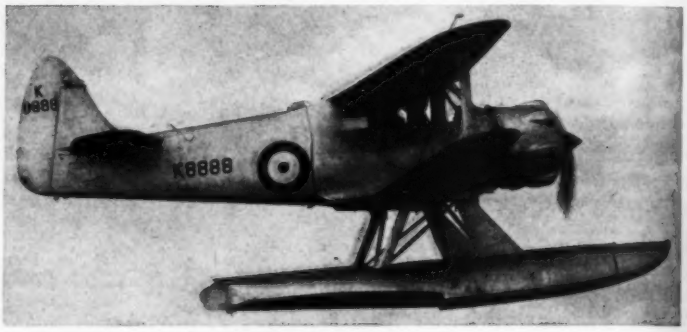
In a different category, the Miles Kestrel trainer seems destined for a useful career. A low-wing wooden monoplane with "inverted gull" wing roots, this model is powered with the R.R. Kestrel XVI engine, which drives a three-bladed D.H. v.p. airscrew. Quite apart from its functions as a high-performance trainer, it may be used for reconnaissance and bombing, and may be considered as a two-seater fighter, a multi-gun single-seater fighter, or a general-purpose machine with a speed range of 5 to 1.

Data are: Length 30ft., span 399ft., track 12ft. 6in., wing area 210 sq. ft., top speed at 16,000ft. 295 m.p.h., service ceiling 30,000ft.

With its trailing edge flaps, Gipsy Major engine and sturdy construction, the Miles Magister will be a welcome addition to the ranks of Service trainers.

But one outstanding characteristic of the De Havilland Don comprehensive trainer is the cooling system of the Gipsyking engine. (*Flight* photograph).





The Lynx-engined Avro Tutor trainer is seen above as a single-seater specially equipped for inverted flying. It is normally a dual-control two-seater. (*Flight* photograph). **The Airspeed Queen Wasp wireless-controlled target floatplane (right) has a Siddeley Cheetah IX engine and a better performance than the present standard target aircraft.** (*Flight* photograph.)

The De Havilland Don, aptly described by its manufacturers as a "comprehensive military trainer," is likewise a low-wing cantilever monoplane with retractable undercarriage. Dual controls are fitted in an enclosed cabin, and there is a gun turret for practice and instruction. The engine is the D.H. Gipsyking, which has inlets for the cooling air in the leading edge of the wing.

For twin-engined training duties Airspeeds are supplying the Oxford, which may be regarded as a development of the Envoy transport. The Oxford has side-by-side dual control, a gun turret, bomb stowage, and is designed to carry a great variety of Service equipment. Two Siddeley Cheetah X engines are fitted, driving D.H. v.p. airscrews.

Data for the Oxford are: Span 53ft., weight (empty) 4,800 lb., weight (loaded) 7,300 lb., top speed 197 m.p.h., service ceiling 23,000ft., stalling speed 64 m.p.h.

The De Havilland Tiger Moth, Avro Tutor and Avro 626 biplane trainers, although designed some years ago, all have applications in the modern air force.

The Tiger Moth (Gipsy Major) and Tutor (Lynx IVc) are normally used for flying tuition, although the former, despite its low power, may be used for instruction and practice in the use of a wide variety of military equipment. The 626 (Cheetah) has a higher performance than either and is also designed to carry a diversity of military equipment, including a free machine gun, for instructional purposes. Numerous examples have been sold abroad.

TARGET AIRCRAFT

So far as is known, Great Britain is well ahead in the development of wireless-controlled target aircraft for gunnery practice. Such machines are normally operated as floatplanes from catapults. The standard type now in service is the De Havilland Queen Bee, which is a special adaptation of the Tiger Moth trainer.

Intended as a Queen Bee replacement, the Airspeed Queen Wasp is a biplane with sharply tapered wings, a cabin, Cheetah IX engine and a sturdy, but clean, float undercarriage. Elaborate slinging arrangements have been incorporated.

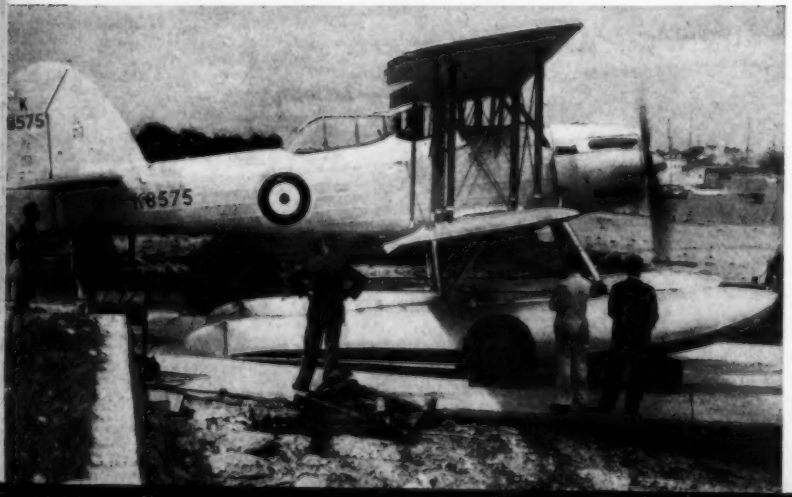
MARINE AND COAST DEFENCE

The aircraft falling under this comprehensive heading may be categorised as ship-planes operating from naval vessels, flying boats and coastal defence torpedo bombers.

Deck-landing types now in service are the Hawker Nimrod single-seater fleet fighter (Kestrel V), Hawker Osprey two-seater fleet fighter reconnaissance machine (Kestrel V) and Blackburn Shark and Fairey Swordfish torpedo spotter reconnaissance aircraft. For catapult work there are the Supermarine Walrus amphibian Fairey Seafox floatplane and seaplane versions of the Osprey, Shark and Swordfish.

The Nimrod is a development of the Fury and is regarded as obsolescent. The Osprey, in its Mk. IV form, is more recent, while the Shark and Swordfish are also comparatively modern. A two-three-seater biplane braced with a system of N struts, the Shark is usually powered with the Siddeley Tiger VI and does something like 160 m.p.h. when carrying reconnaissance load. The centre and rear portions of the Alclad monocoque fuselage are made watertight, rendering unnecessary flotation gear. The torpedo is slung from a patent Blackburn carrier.

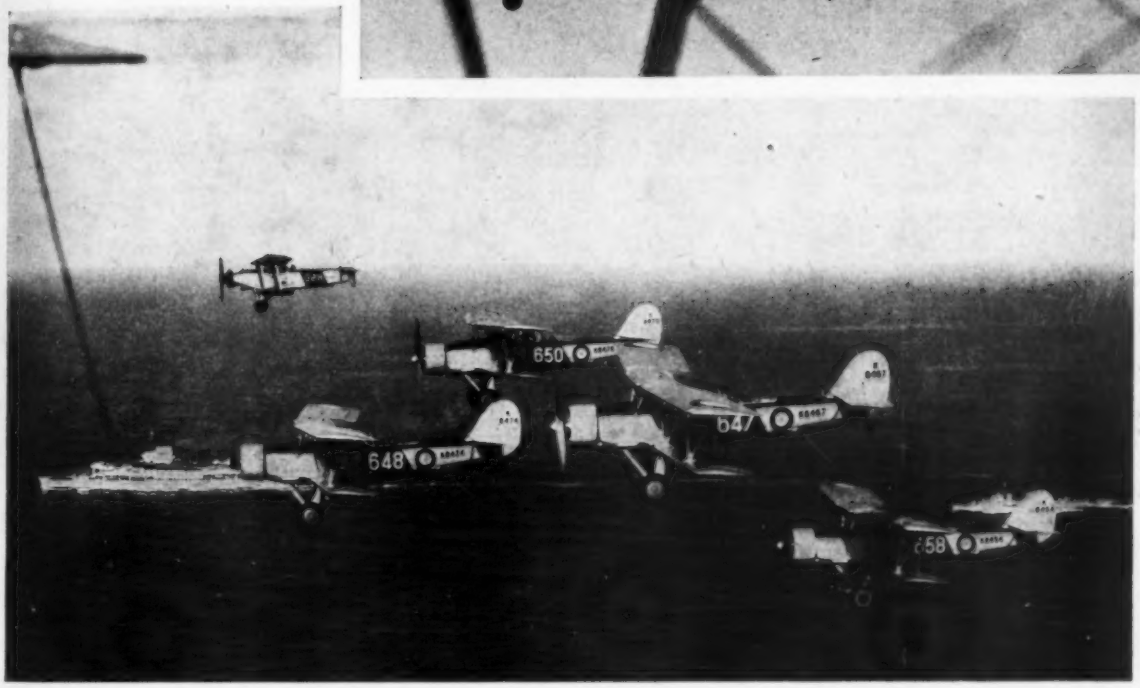
Data for the Shark as a spotter reconnaissance machine are: Range at 110 m.p.h. at 8,000ft.



Two Fairey naval biplanes: (top) the Swordfish torpedo spotter reconnaissance machine (Pegasus III or X), and (below), the Seafox light reconnaissance seaplane with 16-cylinder Rapier engine. Both types are in service with the Fleet Air Arm. (*Flight* photograph.)

The Blackburn Skua dive-bomber fleet fighter is the first monoplane to go into quantity production for the Fleet Air Arm. It is designed for a sleeve-valve Perseus. (*Flight* photograph.)

Blackburn Shark torpedo spotter reconnaissance machines of the Fleet Air Arm with a Blackburn Baffin torpedo bomber beyond.



792 miles, service ceiling 20,400ft., weight empty 4,039lb. weight loaded 7,040lb.

The Fairey Swordfish T.S.R. meets similar requirements to the Shark, but has fabric covering and a Pegasus medium supercharged engine (Series III or X). A speed of 152 m.p.h. is attainable with the older type Pegasus when carrying reconnaissance load. The flotation gear includes air bags and a collapsible dinghy.

The Supermarine Walrus is a unique type of biplane amphibian with a Pegasus VI engine functioning as a pusher installation. Its hull is flush-riveted and the fabric-covered wings have spars of stainless steel. Spotting and reconnaissance are the main functions of the machine; the armament comprises two free guns and a light bomb load.

It is an interesting fact that the Walrus (known as Seagull V in the Royal Australian Air Force) was the first machine with retractable undercarriage to go into quantity production for the R.A.F.

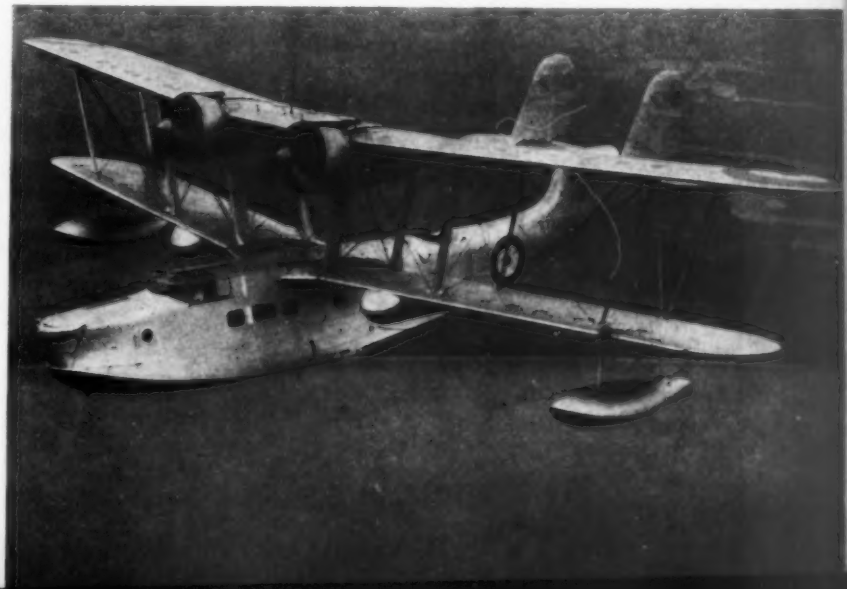
To meet the particular requirements of the British Navy for a light reconnaissance seaplane for catapult operation the Fairey company has produced the Seafox, a comparatively small two-bay biplane with a monocoque fuselage and a Napier Rapier VI engine. Two or three of these machines will be allotted to each of several cruisers.

The performance is not startling and only one gun—a free Lewis—is specified, but there is no doubt that the Seafox meets the particularly exacting demands placed upon it and that it is a very welcome addition to the range of British marine aircraft.

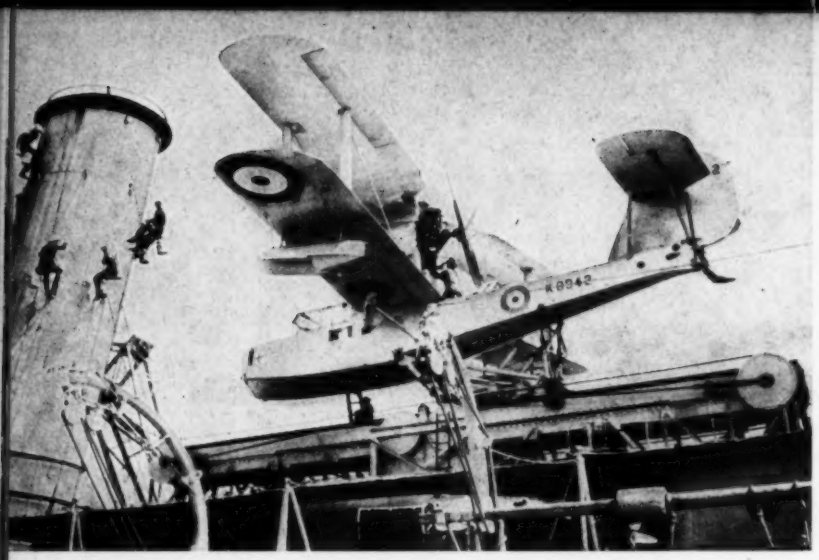
Three types of flying boat may be regarded as "current" at the present time—the Supermarine Stranraer, Saro London and Short Singapore III. Now classed by the Air Ministry as general reconnaissance machines, all three types are in everyday use in the Service.

The Stranraer, with two Pegasus X engines, does over 160 m.p.h., which is comparable with the speed of some foreign monoplane boats in the same category. Alclad is used for the hull and the wings are fabric covered. The Stranraer, like other British Service flying boats of its class, can operate as a completely self-contained unit with comfortable living and working accommodation for the crew. Machine guns are carried in the extreme bow, amidships and in the stern.

The Saro London is intended for similar duties to those of the Stranraer and has the same type of engine. A flat-sided hull gives excellent seaworthiness and makes for commodious accommodation for the crew. There are three machine-gun positions. Data for the London as fitted with



With two Pegasus X engines the Supermarine Stranraer biplane flying boat has a performance comparable with that of some foreign monoplane boats in the same class. (*Flight* photograph).



The sturdy Supermarine Walrus is extensively used from naval craft, being designed for catapulting. The engine is a Pegasus VI.

Saro London flying boats with two Pegasus X engines are still being delivered to the R.A.F.

Pegasus X engines are: Top speed 155 m.p.h., maximum bomb load 2,200 lb., service ceiling 19,900ft., gross weight (normal useful load) 18,400 lb.

Four medium-supercharged Rolls-Royce Kestrels are fitted in the Short Singapore III. Considerable numbers of these boats are in service in foreign waters, where the comfort offered is particularly appreciated. The top speed is 145 m.p.h., the ceiling 15,000ft. and the take-off time in a flat calm 22 seconds.

For coastal defence certain R.A.F. units are armed with the Vicker Vildebeest torpedo bomber variously powered with the Pegasus or Perseus engine. The Vildebeest has a disposal load of about 4,000 lb.

It will, of course, be realised that several prototypes are still held secret. It is legitimate to expect that new two-seater fighters, flying boats and fleet aircraft will be completed before very long, for replacements will undoubtedly be needed. Possibly the Air Ministry may incline toward the use of twin-engined fighters as advocated on the Continent; perhaps "cannon" will be specified for the armament of fighters; maybe we shall see four-engined bombers. . . .

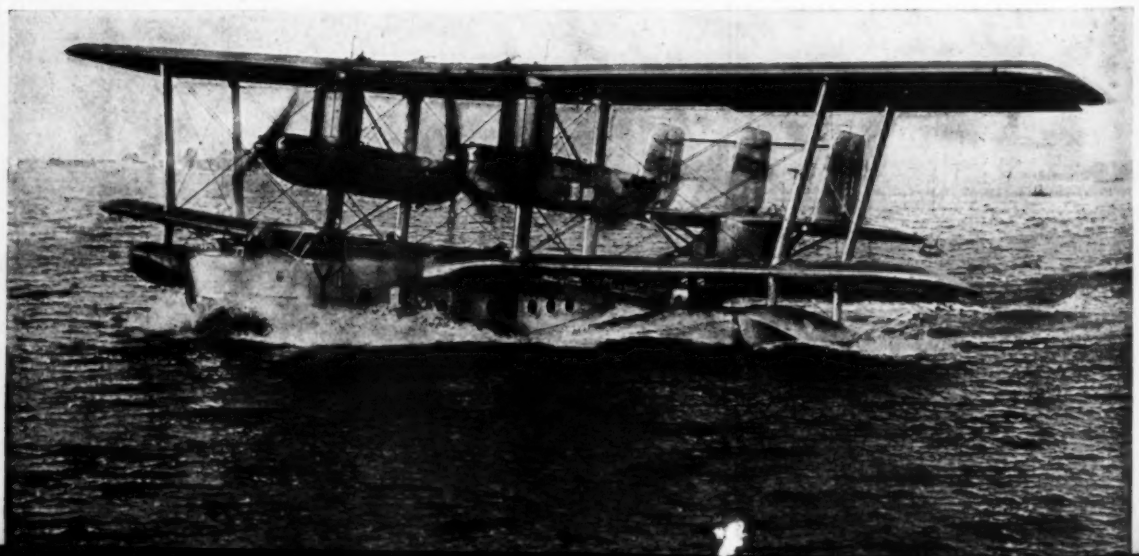
ENGINES: A REFERENCE TABLE.

Maker's Name and Type.	Number and Arrangement of Cylinders.	Rated Altitude.	Normal Rated Power.	Maximum Altitude Power.
ARMSTRONG SIDDELEY.		ft.	h.p.	h.p.
Lynx IVc	7 R.	S.L.	215	240
Cheetah IX	7 R.	6,000 M.S.	310	350
Cheetah X (v.p.)	7 R.	7,000 M.S.	325	350
Serval I	10 2-R.	S.L.	340	365
Panther II A	14 2-R.	5,500 M.S.	560	650
Tiger VI	14 2-R.	5,000 M.S.	760	810
Tiger VIII (v.p.)	14 2-R.	6,200 M.S. 12,800 S.	840 756	862 782
Tiger IX (v.p.)	14 2-R.	6,250 M.S.	775	810
BRISTOL.				
Jupiter VIII F	9 R.	4,000 M.S.	460	480
Mercury VI S	9 R.	12,500 S.	605	645
Mercury VIII, IX (v.p.) ...	9 R.	13,000 S.	825	840
Mercury XI, XII (v.p.) ...	9 R.	3,500 M.S.	820	890
Pegasus III	9 R.	3,500 M.S.	690	750
Pegasus X	9 R.	4,000 M.S.	815	850
Pegasus XVII, XVIII (v.p.)	9 R.	5,000 M.S. 15,000 S.	855 800	940 900
Pegasus XIX, XX (v.p.) ...	9 R.	8,500 S.	835	925

Maker's Name and Type.	Number and Arrangement of Cylinders.	Rated Altitude.	Normal Rated Power.	Maximum Altitude Power.
BRISTOL—*continued.*		ft.	h.p.	h.p.
Pegasus XXII, XXIII (v.p.)	9 R.	4,000 M.S.	850	915
Perseus VIII (v.p.)	9 R.	6,500 M.S.	745	890
DE HAVILLAND.				
Gipsy Major	4 I.L.	S.L.	120	130
Gipsy queen I	6 I.L.	S.L.	185	200
Gipsy king I (v.p.)	12 I.V.	—	—	550
NAPIER.				
Rapier VI	16 H.	4,750 M.S.	370	395
Dagger III	24 H.	3,500 M.S.	725	805
ROLLS-ROYCE.				
Kestrel V, VI...	12 V.	11,000 S.	600	640
Kestrel VI (de-R.)	12 V.	11,000 S.	505	625
Kestrel X	12 V.	S.L.	585	630
Kestrel XIV, XV, XVI ...	12 V.	11,000 S.	690	745
Kestrel XIV, XV, XVI (v.p.)	12 V.	12,250 S.	715	745
Merlin I	12 V.	12,250 S.	990	1,025
Merlin II (v.p.)	12 V.	12,000 S.	990	1,050

R = Radial. 2-R = Two-row Radial. L = In line. V = Vee formation. H = "H" formation. I = Inverted. S = Supercharged. M.S. = Moderately supercharged. S.L. = Sea level. v.p. = Variable pitch airscrew rating.

The Short Singapore III, with four medium supercharged Kestrels, is doing excellent service in home waters and overseas.



BRITISH CIVIL AIRCRAFT: THE SMALLER TYPES

A Review of the Machines Available To-day

ANY distinction between large and small civil types is essentially a compromise. In this review the line has been drawn at the four-five-seater, any machine normally carrying fewer than six passengers being considered as belonging to the light or private-owner class.

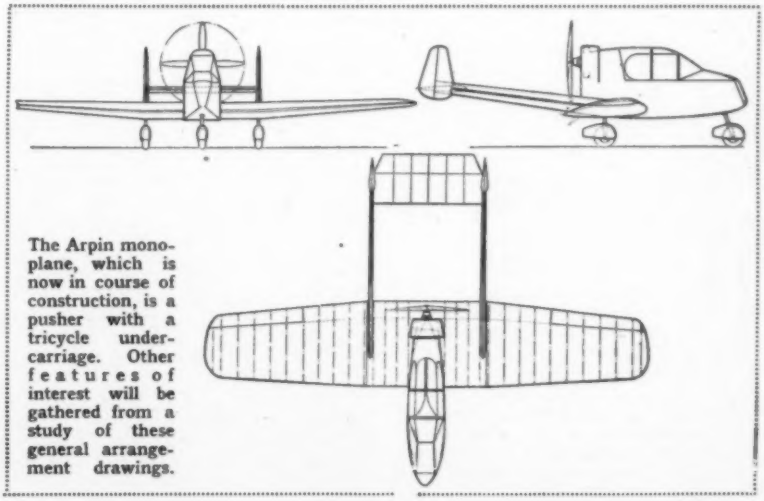
Among the machines described in this section several have their place in each class. The D.H. Dragonfly and the Universal Monospar, for instance, make admirable feeder-line or charter types, and the Ambulance version of the latter should really be installed in a section of its own. The B.A. Eagle, the Heston Phœnix and the Percival Vega Gull can be considered either as private or charter types, while the D.H. Tiger Moth and the Miles Magister are economical trainers for civil or service use. The list of multi-purpose machines could be extended almost indefinitely. However, the division of types at least gives the casual reader some breathing-space and the majority of the more serious readers will find it more easy to pick out the types in which they are interested. Incidentally, there are more than thirty types in this section; so much for the Jeremiahs. Performance and other figures will be found in the table on page 522.

ARPIN

THE first machine in this country to be designed around a tricycle type of undercarriage, the *Arpin* pusher, is a type which is now in process of development. Safety and comfort have been the two points for which the designer has striven. By placing the engine behind, an almost perfect field of useful view has been provided for the occupants, and the controls have been arranged so that it is almost impossible for the pilot to get into difficulties.

Generally speaking, the layout is somewhat similar to that of the Stearman-Hammond, which was described in last week's issue, the specification including twin fins and rudders supported on tailbooms, and a split flap, which extends unbroken from aileron to aileron. The engine to be fitted is a British Salmson of 68 b.h.p.

M. B. Arpin and Co., Longford, West Drayton, Middlesex.



The Arpin monoplane, which is now in course of construction, is a pusher with a tricycle undercarriage. Other features of interest will be gathered from a study of these general arrangement drawings.

Two British Aircraft types, the Eagle (above) and the Pobjoy-engined Swallow. The new alternative version of the former, with fixed undercarriage, is illustrated, and the Swallow is, of course, available with the Cirrus Minor engine. (*Flight* photographs).

AERONCA

A DEVELOPMENT of the well-known Aeronca light cabin monoplane, the *Ely*, is to be first production of the reconstructed Aeronautical Corporation.

In comparison with the Aeronca, the side-by-side cabin has been widened and fitted with a door on each side, the forward view has been improved, a larger roof window has been arranged with a rearward view mirror, the wing-bracing wires have been replaced by struts, and the fuel tank is of 30 per cent. greater capacity.

Apart from the new wing bracing system, the construction will follow the straightforward methods used in the original Aeronca, with a welded steel fuselage and tail unit, and a braced, fabric-covered wooden wing. Two Ely models will be available: a trainer with "service" finish and full dual control, and a private type in which there is a solo control system with rather more specially considered upholstery. The latter is readily convertible to the former. The standard instrument equipment includes a cross-level and Sestrel compass, but a turn indicator, fore-and-aft level and Mk. IIIA compass can be fitted to order.

The engine is the Aeronca-J.A.P., which gives 34-36 b.h.p. at 2,400 r.p.m.; the long-distance cruising revolutions are 2,250, at which the cruising speed of the machine is 72 m.p.h.—or 82 m.p.h. at 2,400 r.p.m.

Aeronautical Corporation of Great Britain, Ltd., Walton Works, Peterborough.

BRITISH AIRCRAFT

EACH filling a special niche in the light aeroplane market, the Swallow and the Eagle have been on the market for several years.

The *Swallow*, which, is a lightly loaded low-wing monoplane, has been adopted as a training type by a number of clubs and schools, and its safe and easy flying characteristics are coupled with a performance which is extremely good when its low power and landing-speed are taken into consideration. Its construction is straightforward, and during the past season the machine has been available with either a Pobjoy Cataract III or a Cirrus Minor engine, the performances being generally similar with each power unit.

A three-seater low-wing cabin monoplane, the *Eagle* cruises at 130 m.p.h. with a D.H. Gipsy Major engine. The occupants sit in an adequately windowed and soundproofed cabin—in fact, the machine has a reputation for being one of the quietest single-engined machines on the market. The construction, again, is of wood, and the machine is especially interesting because the undercarriage is retractable. Those who shirk the slight responsibility of this arrangement can now obtain the Eagle with a clean fixed cantilever undercarriage with Lockheed Airdraulic legs. The reduction in cruising speed is very small and, apart from a slight saving in weight, the fixed undercarriage permits a shorter take-off run, due to the reduced drag and the greater effective wing-area.

British Aircraft Manufacturing Co., Ltd., Hanworth Aerodrome, Victoria Road, Feltham, Middlesex.

CARDEN-BAYNES

UNTIL a suitable British engine becomes available the *Baynes Bee*, a light twin-engined two-seater, described in *Flight* in the issue of March 18 this year, will not be put into production. This machine, it may be remembered, is a side-by-side seater, with the two pusher engines faired into the high wing and a number of other interesting features. The cantilever wing, tail plane and fin are, for instance, each built round what are virtually two parallel spars with laminated webs on one side only, these spars being joined by diaphragms or bulkheads and covered above and below by ply sheeting. The wing is attached at three points, the withdrawal of two pins allowing it to swivel round into a fore-and-aft position for storage purposes.

Meanwhile, work is going on with the design of the Baynes B.4, which will be made by a new company, Baynes Aircraft, which will acquire the present undertaking. No details of this project are at present available.

Carden-Baynes Aircraft, Ltd., Heston Airport, Middlesex.

CHILTON

NEARLY a year ago the two people behind Chilton Aircraft, Messrs. Dalrymple and Ward, started serious work on the design and construction of an ultra-light single-seater which was intended to be really outstanding both in practical performance and economy. The machine was flying early in the summer, and, once minor cooling and airscrew difficulties had been overcome, showed that both its cruising speed and general handling qualities exceeded expectations.

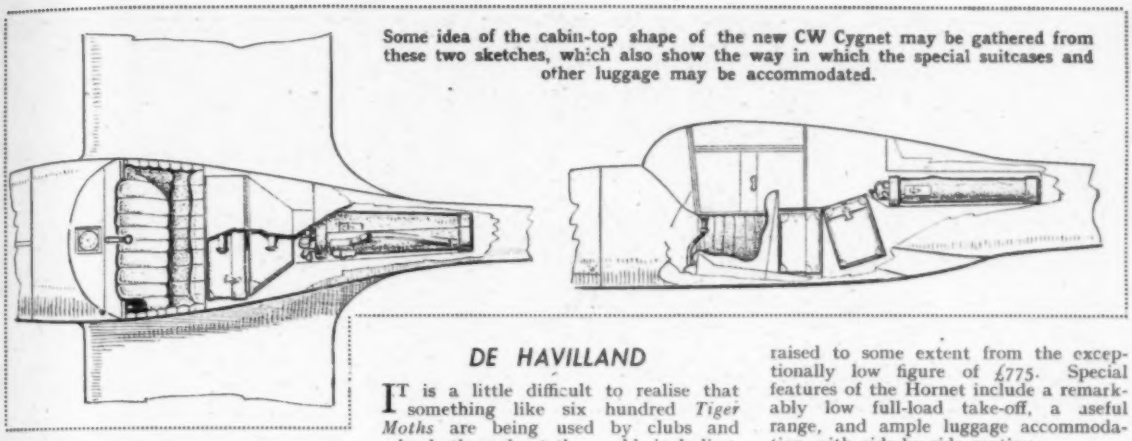
The construction of the *Chilton*, which is a low-wing monoplane, is quite orthodox, and the designers have concentrated largely on the business of making the machine as practical as possible. It is clean enough to travel at what, on 32 h.p., is quite a remarkably high speed—112 m.p.h.—and practicability in this case obviously demanded the use of split flaps both to steepen the approach and reduce the landing speed. The engine at present fitted is a converted Ford Ten, for which Chilton Aircraft are now responsible, but the machine may be fitted with any other engine weighing less than 200 lb.—the French 44 h.p. Train four-cylinder being suggested as a useful alternative for the pilot who requires an even more exciting performance.

Chilton Aircraft, Hungerford, Berks.

C.-W. AIRCRAFT

THE first private-owner type in the smaller class to be designed on an all-metal stressed-skin basis, the C. W.

An interesting development of which more may be seen when suitable power units are available—the twin-engined Baynes Bee. (*Flight* photograph).



Some idea of the cabin-top shape of the new CW Cygnet may be gathered from these two sketches, which also show the way in which the special suitcases and other luggage may be accommodated.

Cygnet, has, during the last nine months or so, been put thoroughly through its paces and will shortly be reappearing in final form.

It is, of course, a side-by-side two-seater low-wing monoplane, fitted with a Gipsy Major engine and, in its latest form, very special attention has been paid both to the cabin roof and screen shape and to the general accommodation.

Built-in suitcases of a useful size will be provided with the machine, there is a recess for such things as golf clubs, and plenty of room behind the squab for the usual oddments. There will be two doors. central or full dual control (quickly interchangeable) and a standard dashboard arrangements leaving ample space for any additional instruments required.

The latest performance figures for the Cygnet will be found in the table on page 522.

C-W Aircraft, Oxford Avenue, Trading Estate, Slough.

DE HAVILLAND

IT is a little difficult to realise that something like six hundred *Tiger Moths* are being used by clubs and schools throughout the world, including, of course, the majority of the Reserve schools in this country. Naturally enough, such popularity is not the result of an accident, and the Tiger can be said to form an excellent compromise in the matter of flying and maintenance qualities. It is fully and pleasantly aerobatic without being in the least tricky for *ab initio* work, and is entirely orthodox in construction.

More, perhaps, than in the case of a training type, compromise is necessary in the design of a machine for the private owner—who may be a twenty-hour pilot or one with a vast amount of general flying experience. Owing to the recent rise in material and production costs it has appeared during the last month or two that the well-known *Hornet Moth* might be withdrawn from the market. We are glad to say that this excellent little two-seater cabin machine is now again in production, following an inevitably large number of pathetically worded enquiries, though the price will necessarily have to be raised to some extent from the exceptionally low figure of £775. Special features of the Hornet include a remarkably low full-load take-off, a useful range, and ample luggage accommodation with side-by-side seating.

Originally produced for the luxury private owner and charter market, the popularity of the twin-engined *Dragonfly* for transport and blind-flying training has been adequately shown during the past year. The Danish, Swedish, Roumanian, Turkish, other Governments, and one or two clubs and schools in this country have shown considerable interest in its possibilities. Several of these training Dragonflies have been fitted with full radio and D/F equipment and with duplicated blind-flying panels, and the need for a twin-engined trainer becomes more obvious year by year. As a private-owner type the Dragonfly is luxuriously equipped, and exhaust and airflow noises have been reduced by careful soundproofing to the large transport decibel level.

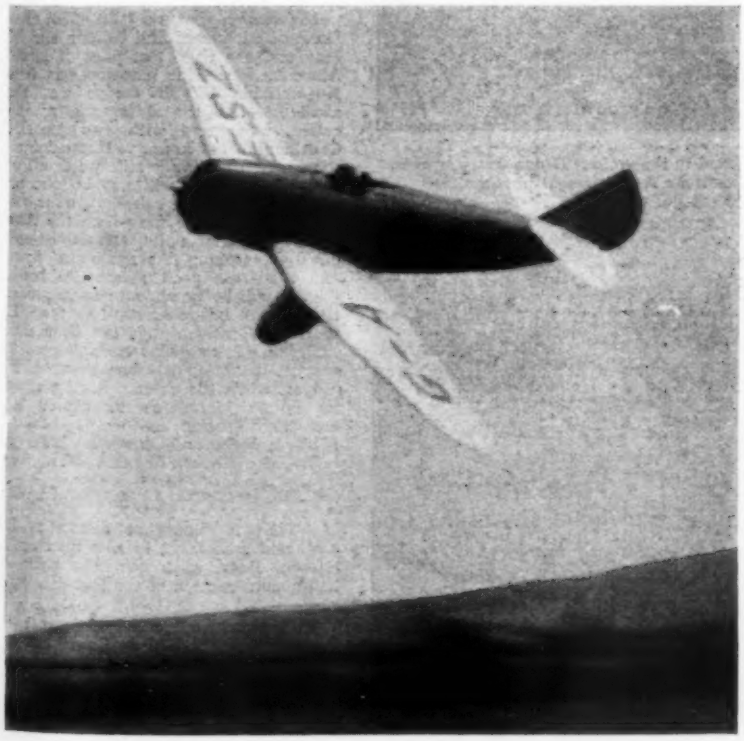
De Havilland Aircraft Co., Ltd., Hatfield Aerodrome, Herts.

HESTON

A MACHINE with an outstanding all-round performance in its original form with a Series I Gipsy Six, the Heston *Phœnix* is now available, if desired, with the Series II engine and v.p. airscrew. This installation, needless to say, puts up the normal-output cruising speed quite effectively and reduces the take-off run, and it is the Phœnix in this form for which the figures are given.

The designer's idea in laying out this machine was to transport a pilot and four passengers in considerable luxury and at a reasonably high cruising speed on comparatively low horse-power. A great deal of attention has been paid to the soundproofing, ventilation and upholstering, and the Phœnix is probably the quietest single-engined machine on the British market. Furthermore, the fact that a disposable load of 1,200lb. or so is carried on 200 h.p. at a cruising speed of 135 m.p.h. definitely gives the machine a place in the charter or small transport market. From the pilot's point of view the layout and handling qualities are excellent, and the occupants enjoy the comfort of armchair flying, with the excellent all-round view available with the high wing arrangement. There is ample luggage space and the machine can be purchased, if required, with full night-flying equipment, generator, and electric s...ter.

Heston Aircraft Co., Ltd., Heston Airport, Middlesex.



Possessed of a remarkably good performance for a machine with only 32 h.p., the single-seater Chilton monoplane has now been flying quite successfully for several months.

Suitable either as a luxury private owner's machine or as a transport trainer, the D.H. Dragonfly has been fitted with floats for work in Canada.

HILLSON

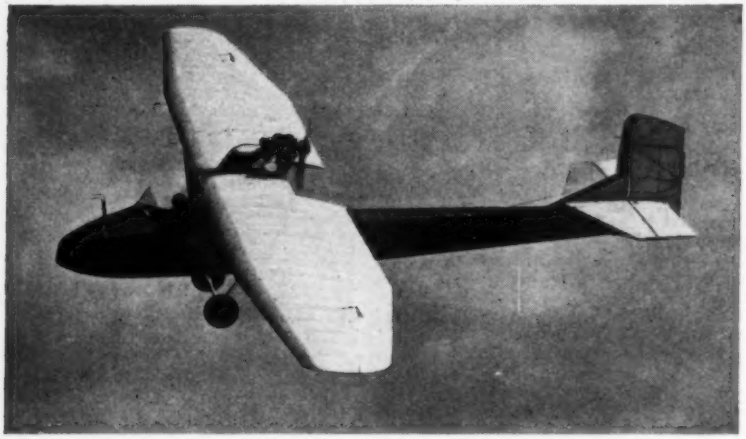
AS an economical trainer or tourer the Hillson *Praga*, the Anglicised version of a Czechoslovakian machine which held a number of light aeroplane records, has distinct possibilities. It was, in fact, one of the first two-seater cabin types in the ultra-light class to make its appearance and is being built in this country by a firm with a long and wide experience of woodwork in general.

The machine is a high-wing cantilever monoplane in which the occupants are seated side by side with, if required, full dual control. With as little as 40 h.p. the Praga has a cruising speed of 93 m.p.h.—a figure which has been borne out by the machine's timed speeds over closed circuits in a number of races and so forth both before and after its introduction into this country some two years ago.

Something extremely interesting in a rather larger class from the Hillson factory should shortly be making its appearance and its first test flights.

F. Hills and Sons, Ltd., Trafford Park Road, Trafford Park, Manchester.

A low-powered side-by-side cabin two-seater, the Hillson Praga has a number of excellent features. This illustration shows the way in which the cabin top and leading edge lift for entry. (*Flight* photograph.)



A number of different engines have been fitted to the various Drone developments. This particular model has a flat-four two-stroke Ava. (*Flight* photograph).

HORDERN-RICHMOND

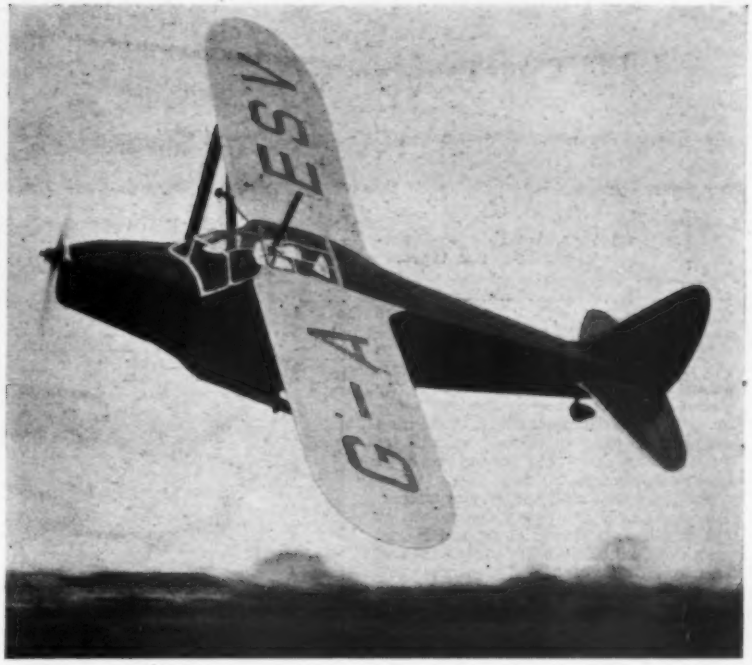
DESIGNED and built with definite ideals in view, the Hordern-Richmond monoplane strikes a new note in the light aeroplane market since it has two engines with the potentially greater reliability and unobstructed view provided thereby.

The prototype was a joint effort of the Duke of Richmond and Gordon and Mr. Hordern, the chief test pilot of Heston Aircraft, where the machine was built. No suitable British engine was then available, and the *Autoplane*, as it is called, was fitted with two American Continental flat-fours. Unfortunately, the engine question is still a difficult one and the machine will not be put into production until suitable units are available. In the meantime the Autoplane has shown its attractive paces during something like 150 hours' flying, and there are good reasons to believe that it will be possible to start production in the not-too-distant future. The prototype, incidentally, has been flown with an interesting control-operating system, in which a wheel controls the rudder, while the column itself performs its normal functions in aileron and elevator operation.

Hordern-Richmond Aircraft, Ltd., 28, Berkeley Street, London, W.1.

INTERNATIONAL

AFTER a somewhat disastrous fire and a removal to new quarters at Barton, Beds, work has been going on in the construction of the first *Marendaz*



The well-known D.H. Hornet Moth (above) which is now in production again, provides exceptionally comfortable transport for two people and their luggage. On the right can be seen the v.p. airscrew version of the five-seater Heston Phœnix which is one of the quietest single-engined machines on the market. (*Flight* photographs.)

monoplane, which should, by now, be in the air.

The Mark III version is a low-wing cabin monoplane in wood, with slots and flaps, accommodating four people seated side by side in pairs, and powered by a Gipsy Six engine. Generally speaking, the structure of both this and the Mark IV model—which is similar, but fitted with a Gipsy Major and carrying two people seated side by side—is orthodox, but experiments are being carried out with a new type of flap arrangement in which the flap itself may extend, if necessary, to the wing-tips. It lies ahead of the ailerons and is hinged to the rear spar. When it is lowered there is a gap between the flap and the wing surface to permit the necessary airflow over the ailerons.

International Aircraft and Engineering, Ltd., Barton Airport, Barton, Beds.

KRONFELD

TO the sponsors of the *Drone* must go the credit for the first serious development in recent years of the genuine ultra-light type of machine. Progressing in stages from what was originally only a powered glider the present de luxe Drone can be considered as a real aeroplane with a low-powered engine. The Drone has been produced with various power units, the most recent example being fitted with an Ava flat-four two-stroke. No particular degree of skill is necessary in flying the Drone, and Mr. Kronfeld has developed an interesting ground training scheme with special machines, the pupil graduating from a plain "Penguin" to a machine which flies, but only just, and thence to the Drone itself.

Kronfeld, Ltd., London Air Park, Feltham, Middlesex.

LUTON

SINCE the Luton Minor and Buzzard were first introduced various slight modifications and improvements have been made to both, and an enlarged version of the former is now being built.

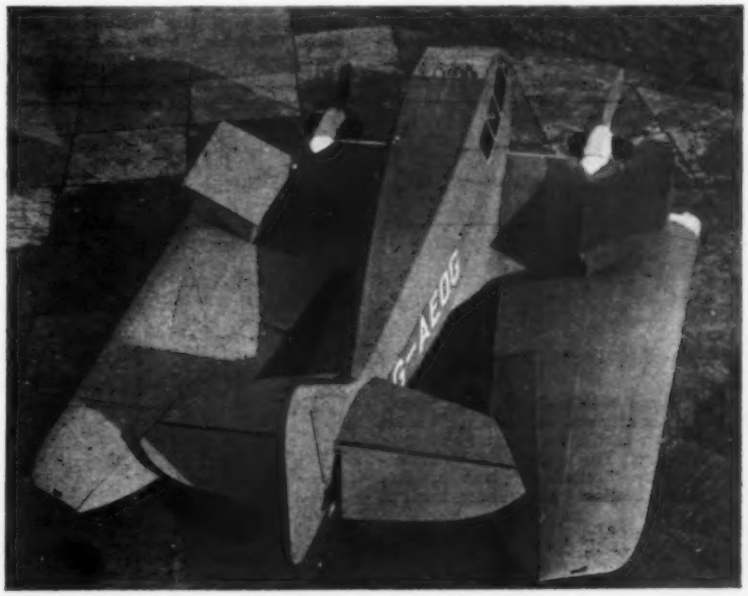
The *Minor*, which is a conventional tractor monoplane of parasol lay-out, has a redesigned fuselage and tail, and an orthodox undercarriage has been fitted in order that the fuselage may be lifted well clear of the ground. The Luton Anzani engine, which is the standard power unit for both this machine and the Buzzard, has been cleaned up and is available with dual ignition. A high-efficiency pusher type, the *Buzzard* is interesting particularly because it is fitted with split trailing-edge flaps to steepen the approach and reduce the landing speed.

Meanwhile an enlarged two-seater version of the Minor, to be known as the *Major*, is in course of development. This will have folding wings and an enclosed cabin.

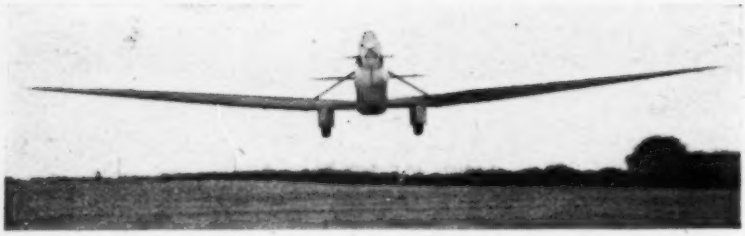
Luton Aircraft, Ltd., Phœnix Works, Gerrards Cross, Bucks.

MILES

SINCE the long-awaited Miles *Whitney Straight* made its first official public appearance at the beginning of this year Phillips and Powis Aircraft have been busy catching up with the large number of orders which had already been received and which have come in since. In many ways the "Straight" has set a new



Something new in private owner types: the Hordern-Richmond twin-engined monoplane shown with the wings folded. Production awaits the appearance of a suitable power unit. (*Flight* photograph).



A high-efficiency ultra-lightweight pusher—the Luton Buzzard (left).

Making its first public appearance early this year, the Miles Whitney Straight has sold, and is selling, in comparatively large numbers. On 130 h.p. the Straight carries two people and their luggage at a cruising speed of 130 m.p.h.

standard in all-round utility and performance among private-owner types.

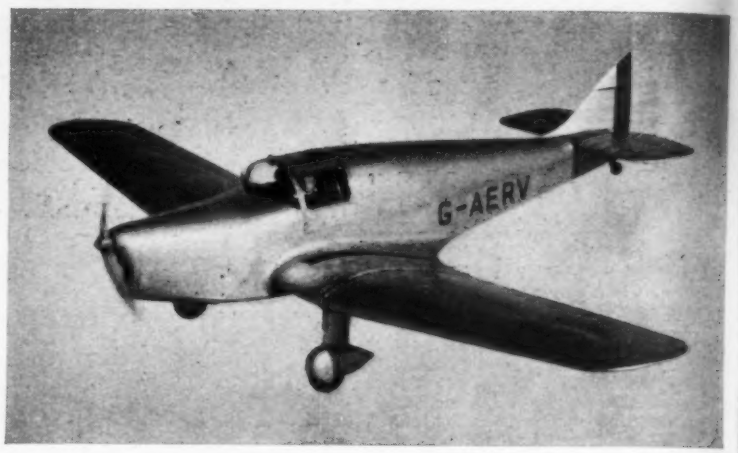
It is, of course, a low-wing side-by-side seater cabin monoplane with vacuum-operated split flaps and the structure follows conventional Miles practice. Special attention has been paid to the need for safe and easy flying characteristics and it is almost true to say that the machine can be landed "anyhow." The undercarriage has been designed to take a vertical velocity of 15 ft./sec. and the normal stall is innocuous enough.

Designed as a civil and service trainer, the *Magister* is the direct descendant of the well-known Hawk Major and is sold with full dual blind-flying equipment and an aerobatic C. of A. With the present trend towards low-wing types for all purposes, the *Magister* should have a useful range of duties.

A more recent development is the *Mentor*, which can be used for blind-flying instruction, training and charter operations, or by the more ambitious kind of private owner. The cabin comfortably accommodates a pilot and three passengers with their luggage, and in general layout the machine may be considered in this case as being the lineal descendant of the Merlin.

Two other interesting smaller types have recently been produced by Phillips and Powis—the *Mohawk*, which was built to the special order of Col. Lindbergh, and the *Hobby*, a purely racing affair originally designed and made for the King's Cup.

Phillips and Powis Aircraft, Ltd., The Aerodrome, Reading, Berks. (*The Miles Whitney Straight is handled by Whitney Straight, Ltd., 17, Manchester Square, London, W.1.*)



MONOSPAR

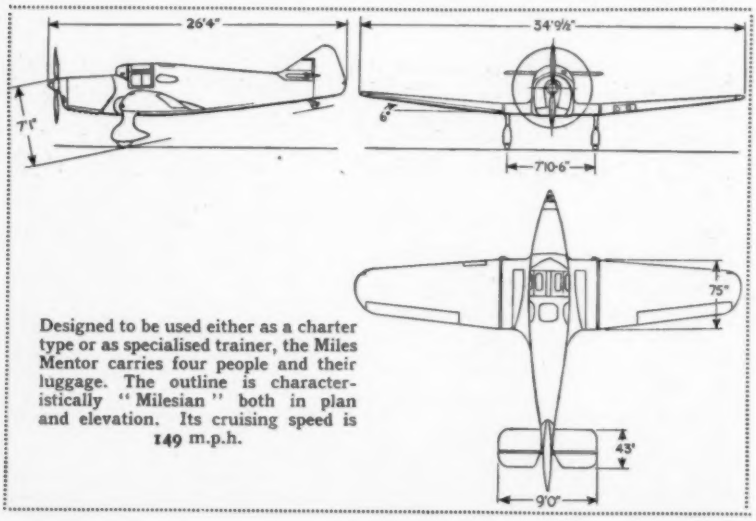
SINCE the original introduction of the Monospar S.T.25, three distinct versions of this machine have been available—the De Luxe, a four-seater, private-owner or feeder-line type; the Ambulance, designed under the auspices of the British Red Cross; and the Freighter.

For this and the coming season General Aircraft are producing the *Universal* model, which, though normally a comfortable four-seater transport, can quickly be converted into a freighter or an ambulance. In freighter guise the whole of the rear of the cabin, with a capacity of 84 cu. ft., is available for goods and, as an ambulance, this space is taken up by a stretcher, table and collapsible seat with stowage for specialised medical equipment.

The Monospar is, of course, of all-metal construction and the wings fold easily for storage purposes. With the help of a twin-rudder arrangement and ample dihedral the machine is exceptionally stable both laterally and directionally, and flying with one engine throttled back is neither arduous nor difficult. The machine is very fully equipped in standard form, with dual pedals and swing-over control half-wheel and full night-flying equipment, including a landing light, and the business of bonding and screening for normal receiver installation involves the operator in no additional expense. The price given in the table on page 522 is for the standard Universal; in fully equipped ambulance form the price is £2,500—or £2,750 with two-way radio.

Recently, General Aircraft have been using the Universal for tricycle undercarriage experiments.

General Aircraft, Ltd., London Air Park, Feltham, Middlesex.



Designed to be used either as a charter type or as specialised trainer, the Miles Mentor carries four people and their luggage. The outline is characteristically "Milesian" both in plan and elevation. Its cruising speed is 149 m.p.h.

MOSS

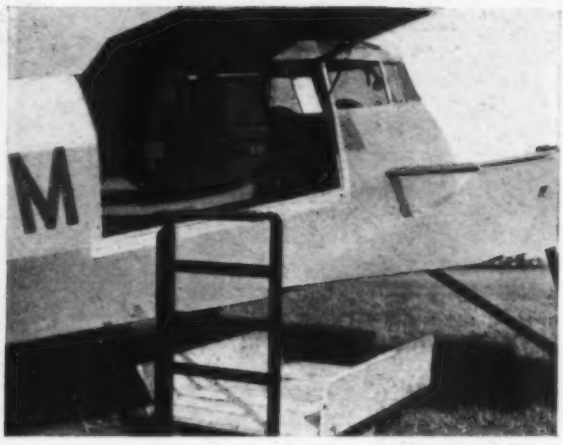
DESIGNED to the specification of five flying brothers, the *Moss* monoplane might be expected to comply with the average ideals of the average private pilot. It is a low-wing tandem monoplane with split flaps and powered in its present form with a Pobjoy Niagara III. The seating positions have been arranged with the pilot ahead of the c.g., giving him an excellent range of forward and downward vision, and, remembering the comparatively low power, the performance can be considered to be extremely good.

The prototype passed its trials with flying colours—the performance being, if anything, in advance of that estimated—and the machine is now being upholstered and sound-proofed according to modern ideas. The tandem cockpits are fully enclosed in this prototype, but an open cockpit version, for those who prefer it, is now being produced and should be flying early next year.

Moss Brothers Aircraft, Ltd., Chorley, Lancs.

PERCIVAL

AS a high-speed luxury touring machine for the private owner or charter company, the Percival *Vega Gull* has long



The Monospar Universal is, as its name implies, intended as a convertible type for a number of uses. The cabin may be seen in ambulance and freighter form in the pictures above ; normally there are four chairs, and the machine can be considered either as a luxury private-owner type or as a feeder-line proposition.

shown its value and the latest version, with a Series II Gipsy Six and v.p. airscrew, has an even higher cruising speed and a usefully increased payload. Pilots are becoming accustomed to such additions as pitch controls and the v.p. version shows signs of being even more popular than the standard type.

Another attempt to provide what the average private owner requires—the Moss monoplane. In this machine the occupants sit in tandem, the pilot being ahead and provided, consequently, with an exceptionally good all-round view.

The *Vega Gull* is, of course, a four-seater low-wing cabin monoplane with manually operated split flaps, and passenger comfort has been carefully studied. There is a door on each side of the cabin, ample luggage accommodation at the rear, and the wings can be folded by one person for storage purposes.

In the meantime the original *Gull* is still obtainable with either a Gipsy Major or Gipsy Six. This machine carries three and is now fitted with flaps. Miss Batten has used a *Gull* in all her more recent and successful record attempts. For those who require Percival performance at a slightly lower price the Gull still has its place in the market.

The *Mew Gull* is a single-seat cabin machine with a cruising speed at operational height of 225 m.p.h. when fitted with a v.p. airscrew. Though primarily a sporting aeroplane, the Mew carries an extremely useful payload in addition to the pilot, with a standard range of 875 miles, and could be used for high-speed mail or Press work.

Percival Aircraft, Ltd., 20, Grosvenor Place, London, S.W.1.

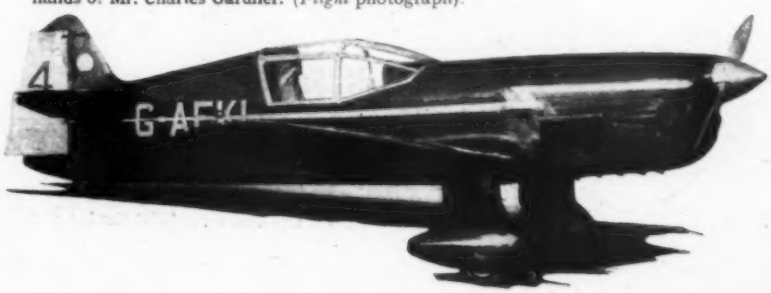
TIPSY

NOW being manufactured under licence from Avions Fairey of Belgium, the two-seater *Tipsy* is the natural development of the single-seater machine and is equally pleasant to fly. It has a similar performance at the top end of the scale, but manually operated flaps are fitted both to steepen the approach and, more important, reduce the landing float which would be otherwise inevitable.

The occupants are seated side by side, but slightly staggered, in an open cockpit; there is full dual control and luggage accommodation. A batch of fifty is now being put through and, there being at present no suitable British engine available, these machines (or most of them) will be fitted with the 60 h.p. Walter Mikron engine. The equipment will embrace all the essential instruments, including a compass. The price given in the table on p. 522 is necessarily a provisional one.

Tipsy Aircraft Co., Ltd., London Air Park, Hanworth, Middlesex.

Essentially an enthusiast's machine, the Mew Gull can nevertheless carry a useful payload. The machine illustrated won this year's King's Cup in the hands of Mr. Charles Gardner. (*Flight* photograph).



The Percival Vega Gull (left) has been obtainable for some time with a Series II engine and v.p. airscrew, increasing the cruising speed and the permissible all-up weight while reducing the normal take-off run (*Flight* photograph.)

(Below) The Tipsy two-seater which is now in production at Hanworth. It is, of course, a natural development of the single-seater Tipsy and is intended as an economical trainer or tourer. (*Flight* photograph.)

WICKO

FOLLOWING the development of a side-by-side seater high-wing cabin monoplane which was successively fitted with a converted Ford V-8 and a Cirrus Minor engine, Foster Wikner Aircraft have gone ahead with a final version of the machine, which can be fitted with either the Minor or the Gipsy Major. In addition a slightly modified and simplified model is still available with the Ford.

The new *Wicko* is similar in general layout to the model originally described, but the strut braced wing is now ply-covered, contour-changing flaps and wheel brakes are fitted, and both the cabin width and the range of useful vision have been increased. The figures given in the table below are those for the Gipsy Major version. The Cirrus-engined Wicko has, too, a usefully high top speed—120 m.p.h.—the payload is still a matter of 220 lb., the range is 450 miles, and the fuel consumption is, of course, a good deal lower. The Ford-engined machine has a rather larger span in order that the take-off shall still be good with a fair load of occupants and luggage; nevertheless, the top speed, again, is quite high—115 m.p.h.—though the range has naturally to be cut down somewhat with the heavier engine.

Foster, Wikner Aircraft Co., Ltd., Southampton Municipal Airport, Southampton.

SMALLER CIVIL AIRCRAFT

Machine.	Engine.	H.P.	No. of seats.	Span (folded if possible).	Length.	All-up weight.	Weight empty.	Max. speed.	Cruising speed.	Landing speed.	Init. rate of climb.	Range at cruising speed.	Price.
				ft. in.	ft. in.	lb.	lb.	m.p.h.	m.p.h.	m.p.h.	ft./min.		
Aeronca Ely	Aeronca-J.A.P. ...	34–36	Two	36 0	20 0	1,050	625	90	72	35	—	320	—
Arpin	Salmson A.D.9.R ...	68	Two	36 6	23 5	1,261	740	108	95	38	680	475	—
Baynes Bee	—	—	Two	9 0	23 0	1,350	880	—	—	—	—	—	—
B.A. Swallow	Pobjoy Cat. III ...	85–88	Two	15 1	27 0	1,500	930	112	98	30	800	440	£875
B.A. Eagle	Gipsy Major ...	130	Three	14 10	26 0	2,400	1,450	148	130	45	700	650	£1,250
C-W Cygnet	Gipsy Major ...	130	Two	34 6	24 3	1,900	1,200	150	130	45	850	650	£1,050
Chilton	Ford	32	One	24 0	18 0	640	398	112	100	35	650	500	£315
D.H. Tiger Moth	Gipsy Major ...	130	Two	29 4	23 11	1,770	1,115	109	93	45	673	290	—
D.H. Hornet Moth	Gipsy Major ...	130	Two	9 9	25 0	1,950	1,255	124	105	40	720	750	£875
D.H. Dragonfly	Gipsy Major (2) ...	130(2)	Five	43 0	31 8	4,000	2,500	147	130	58	875	885	—
Heston Phœnix	D.H. Gipsy Six Series II.	200	Five	40 4	30 2	3,300	2,150	150	137	55	800	725	£2,050
Hillson	Praga B.36	40	—	36 0	27 7	1,029	584	93.3	80	37.3	—	320	—
Hordern-Richmond ...	Continental A.40 ...	37(2)	Three	17 6	24 6	1,750	1,125	100	90	38	—	300	—
Kronfeld Drone	Ford	32	One	10 0	21 2	640	399	73	65	28	—	340	£325
Luton Minor	Luton Anzani ...	34	One	25 0	19 6	600	380	80	70	30	—	210	£250
Luton Buzzard	Luton Anzani ...	34	One	35 6	21 6	600	380	85	75	30	—	260	£329
Marendaz Mk. III ...	D.H. Gipsy Six (2) ...	200	Four	31 0	26 0	No other figures yet available.							£1,500
Marendaz Mk. IV ...	D.H. Gipsy Major ...	130	Two	31 0	26 0								£1,000
Miles Whitney Straight ...	D.H. Gipsy Major ...	130	Two	17 2	25 0	2,000	1,250	145	130	38	850	570	£1,100
Miles Magister	D.H. Gipsy Major ...	130	Two	33 10	25 3	1,900	1,240	145	130	45	1,200	—	—
Miles Mentor	D.H. Gipsy Six Series II.	200	Four	34 9	26 4	2,800	1,750	173	149	53	925	460	—
Monospar Universal ...	Pobjoy Niagara II (2)	95(2)	Four	14 11	25 4	2,875	1,818	131	115	50	710	419	£2,250
Moss	Pobjoy Niagara III.	95	Two	34 0	23 3	1,400	950	130	115	38	—	450	£750
Percival Vega Gull ...	D.H. Gipsy Six Series II.	200	Four	16 0	25 4	3,250	1,740	175	170	44	—	660	£1,995
Percival Gull	D.H. Gipsy Major ...	130	Three	13 2	24 10	2,300	1,285	155	133	40	—	760	£1,295
Percival Mew Gull ...	D.H. Gipsy Six Series II.	200	One	24 0	20 3	2,125	1,150	235	225	60	1,700	875	£1,885
Tipsy	Walter Mikron ...	60	Two	—	—	—	—	—	105	—	700	400	£575
Wicko	Gipsy Major ...	130	Two	31 6	23 3	2,000	1,255	136	120	45	—	500	—

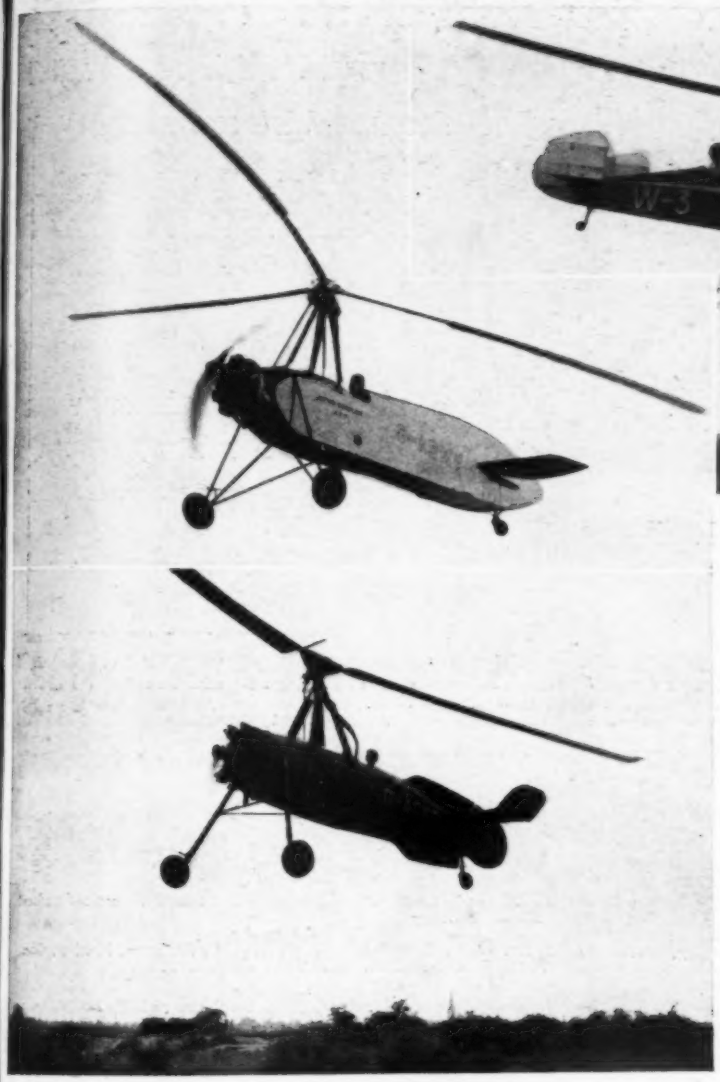
Plessey's Annual

THE effect of the vastly greater amount of Government and other work now being carried out by the Plessey Company was very noticeable at this year's annual (actually the thirteenth) dinner and dance. There were more people than ever before at the Wharncliffe Rooms, and the table management had necessarily to be extended almost into the outer darkness.

Mr. B. G. Clark, father of the managing director, was once again in the chair, and proposed the toast of the annual dinner, to which his son, Mr. A. G. Clark, replied. The toast of the Company was offered by Mr. H. Fletcher, who was one of the original half-dozen people in the firm, and Mr. J. A. Smith, the secretary, replied. Finally, Mr. P. J. Packman, the chief mechanical designer, proposed the toast to the visitors—with allusions to the two-man sports club—and Major H. Parker (one of the two sportsmen) replied in his usual amusing vein. Major Parker is the managing director of De La Rue's, a firm which is doing a good deal of plastic development and manufacturing work, apart from its other interests.

A Delta Director

TO the list of the directors of the Willoughby Delta Company given on p. 485 of last week's issue should be added the name of Mr. S. Walker.



GYROPLANES

British Designs of To-day

DIRECT take-off has now come to be considered an essential of the gyroplane type of aircraft, and the three pictures show three types with which considerable success has been achieved, although all three are regarded as experimental machines and are not on the market. The Weir Autogiro shown in the upper picture is fitted with a Weir engine of 45 h.p. A new version is expected to begin its test flights shortly.

The Cierva "jump-start" Autogiro in the lower photograph has a Siddeley Genet Major engine and incorporates the "autodynamic" rotor head by which the rotor blades automatically go into fine pitch for speeding-up and into coarse pitch for the jump start. A new version is appearing.

The Hafner Gyroplane shown in the middle picture has a 90 h.p. Pobjoy Niagara engine and differs from the other two in that the rotor head does not tilt. Instead there is a control for altering the angle of incidence of the rotor blades. Work on Herr Hafner's 1938 model will shortly begin.

Forthcoming Events

November 25. C.A.S.C. : Dance, First Avenue Restaurant, London, W.C.1.

November 25. R.Ae.S. Coventry Branch Lecture: "Clouds," by Dr. R. C. Sutcliffe.

November 26. Lancashire Aero Club: Annual Ball, Palace Hotel, Buxton (9 p.m.), and Car Rally in conjunction with Lancs and Cheshire Car Club.

November 30. R.Ae.S. Isle of Wight Branch Lecture: "Aeronautical Methods," by Mr. E. F. Relf.

December 1. R.Ae.S. Weybridge Branch Lecture: "Large Aeroplanes," by Dr. H. Roxbee-Cox.

December 2. R Ae.S. Lecture°: "Wing Surface Controls with Reference to Possible Developments in Flying Technique," by Ft. Lt. H. P. Fraser.

December 2. Herts and Essex Aeroplane Club: Annual Dinner and Dance, Park Lane Hotel.

December 7. Colleges of Automobile and Aeronautical Engineering: Annual Dinner and Dance, Grosvenor House, London.

December 8. R.U.S.I. Lecture: "Balloon Aprons," by Air Comdre. J. G. Hearson, Royal United Service Institution, 3 p.m.

December 9. R.Ae.S. Students' Section Lecture (Joint meeting with other bodies): "Torsional Vibration in Engines," by Mr. R. J. W. Cousins.

December 14. R.Ae.S. Isle of Wight Branch Lecture: "Hydraulic Services in Aircraft," by Mr. G. H. Dowty.

December 15. R.Ae.S. Weybridge Branch Lecture: "Anodic Treatment," by Mr. J. Donaldson Craig.

December 16. R.Ae.S. Students' Section Lecture: "Control Surface Design," by Mr. A. F. Walsh.

December 16. R.Ae.S. Coventry Branch: Papers by Members.

December 17. London Aeroplane Club: Dinner and Dance, Park Lane Hotel, London.

1938.

January 5. R.U.S.I. Lecture: "The Training of a Royal Air Force Pilot," by Air Vice-Marshal L. A. Pattinson, Royal United Service Institution, 3 p.m.

January 11. R.Ae.S. Isle of Wight Branch Lecture: "Air Route and Aerodrome Control," by Capt. P. W. Lynch-Blosse.

January 13. R.Ae.S. Lecture°: "Radio as a Direct Aid to Landing Approach," by Sqn. Ldr. R. S. Blucke.

January 14. Strathtay Aero Club: Annual Ball.

January 19-21 (provisional). Aerodrome Owners' Association: Airports Exhibition, London.

January 20. R.Ae.S. Coventry Branch Lecture: "Installation of Aero Engines," by Dr. G. P. Douglas.

January 25. R.Ae.S. Isle of Wight Branch Lecture: "Bird Flight," by Capt. J. Laurence Pritchard.

January 26. R.U.S.I. Lecture: "Imperial Air Routes," by Lieut-Col. H. Burchall, Royal United Service Institution, 3 p.m.

January 28. Northamptonshire Aero Club: Annual Ball at Salon de Dance, Northampton.

February 17 R.Ae.S. Coventry Branch Lecture: "Aircraft Motive Power," by Major E. F. Green.

All these lectures take place at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, beginning at 6.30 p.m.

SERVICE AVIATION

ON HIS MAJESTY'S SERVICE: The Air Council's Airspeed Envoy, used by members of the Royal Family, framed by the fore-part of a Handley Page Harrow heavy bomber.

Royal Air Force and Fleet Air Arm News: Official Announcements: Military Aviation Abroad

A New Cheetah for the Service

THE Airspeed Oxford I advanced twin-engined trainers now in production for the R.A.F. are being fitted with Armstrong-Siddeley Cheetah X seven-cylinder radials driving two-position De Havilland v.p. airscrews. As compared with the Cheetah IX in the Anson the Cheetah X is shorter, due to a regrouping of the accessories. The maximum power is 350 h.p. at 7,500 ft.

Improved Blenheims for Canada

A CONTRACT running into approximately 1,500,000 dollars has been placed by the Department of National Defence, Canada, with Fairchild Aircraft, Ltd., for eighteen coastal reconnaissance machines of an improved Blenheim type known as the Bolingbroke. The construction of these machines will take about three years and will employ between 300 and 400 men.

Aerodrome Control

IT has been decided to introduce a vertical signal to be used in conjunction with the landing "T" in order to ensure that pilots do not take off in conditions of calm or light wind unaware that a "T" is displayed. The signal is to be in the form of a black ball, and is to be hoisted at the duty pilot's mast at all times when the landing "T" is displayed. The ball is to be of local manufacture and of sufficient size to enable it to be seen from any point of the hangar apron. Having observed that the ball is hoisted, pilots are not to take off until they have ascertained the direction of the landing "T."

Our New Carriers

THE keel of H.M.S. *Indomitable* was lately laid at the Vickers Armstrong Barrow yard, bringing up to five the number of new aircraft carriers under construction for the Navy. Farthest advanced of the five is the *Ark Royal*, which was begun two years ago and is due for completion next July. She will be the first new carrier to be commissioned since 1930. Displacing 22,500 tons she will accommodate up to seventy aircraft. Defensive armament will comprise 4.5 in. guns.

Present plans envisage at least doubling the numerical strength of the Fleet Air Arm, while the substitution of modern aircraft for machines formerly in service will mean a much more than proportionate increase in fighting power.

The existing establishment of first-line aircraft in British warships is 217. About 140 machines are carrier-borne, 32 are in catapult-equipped battleships and cruisers and the rest are at shore stations. Excluding the *Argus*, which has been refitted as a depot ship for wireless-controlled targets, the carriers now in service have a total capacity of 165 aircraft.

Central Flying School

THE undermentioned officers and airmen have been recategorised as under:—

A.2 to A.1

Flt. Lt. F. S. Wakeham, P/O. A. A. F. Hickman, Flt. Sgt. Cox, P. C., Sgts. Bannister, S. W., and Gledhill, F. H.

B. to A.2

Flt. Lts. G. W. Montagu, J. F. Stephens, and N. D. Crockart, P/O. S. Lugg, Flt. Sgts. Ogle, J. N., Rye, W. J., and Smith, K. S, Sgts Crawley, B. E., Maun, R. C. A., Irish, E. J., and Ledger, H.

Capt. A. D. Irvine, S.A.A.F., who recently attended a refresher course at the Central Flying School, was assessed at "B" category standard as a flying instructor.

A Transfer Cancelled

The R.A.F. Station of Farnborough will not be transferred to the Fighter Command, as was previously announced.

Reunion Dinners

THE seventeenth annual reunion dinner of No. 3 Squadron, R.F.C. and R.A.F., is to be held at the May Fair Hotel, London, on Friday, December 3, at 7.30 p.m. for 8. The chair will be taken by Air Chief Marshal Sir Edgar R. Ludlow Hewitt, K.C.B., C.M.G., D.S.O., M.C. Tickets are 14s. each, including gratuities, but excluding wines. They may be obtained from the Hon. Secretary, No. 3 Squadron Dinner Club, P/O. M. C. Pearson, R.A.F., Kenley, Whyteleafe, Surrey. The Hon. Secretary is very anxious to get in touch with past members of the Squadron.

It is proposed to hold a twenty-fifth anniversary reunion dinner in London on Friday, December 10, for past and present officers of No. 2 (A.C.) Squadron. Those officers who wish to attend should communicate with the Adjutant, No. 2 (A.C.) Squadron, Royal Air Force, Hawkinge, Nr. Folkestone, Kent.

The sixteenth annual dinner of the R.A.F. Medical and Dental Services will be held at the May Fair Hotel, London, W.1, on Friday, December 10, at 7.30 p.m. for 8 p.m. Tickets, 10s. 6d. each, exclusive of wines, may be obtained from the honorary secretary, Sqn. Ldr. R. G. Freeman, Directorate of Medical Services, Air Ministry, 5-6, Clement's Inn, London, W.C.2.

Foreign Officers Attached

Major G. Schyberg, of the Swedish Royal Air Force, was attached to the Royal Air Force College, Cranwell, from September 20 to October 2, and Capt. H. T. Anilinne, of the Estonian Air Force, is attached to the Army Co-operation Course at Old Sarum from September 20 to December 10.

Royal Air Force Gazette

General Duties Branch

Wing Cdr. A. S. G. Lee, M.C., is seconded for duty with the Turkish Government (October 15); Sqn. Ldr. S. McKeever, D.F.C., is seconded for duty with the Turkish Government (October 15); Flt. Lt. E. H. Wheelwright is transferred to the Reserve, Class A (November 5); Sqn. Ldr. C. W. L. Trusk, A.F.C., is cashiered by sentence of General Court Martial (November 5).

Medical Branch

Flt. Lt. P. J. McNally, M.B., B.Ch., D.P.H., is promoted to the rank of Squadron Leader (November 12).

Chaplains Branch

The Rev. F. Hobbs is granted a short service commission with the relative rank of Squadron Leader with effect from and with seniority of November 2.

Royal Air Force Reserve

Reserve of Air Force Officers

General Duties Branch

The following Flight Lieutenants are promoted to the rank of Squadron Leader (November 5):—F. Thomasson, D.F.C., M.M., R. S. Barbour, T. E. W. Browne, D. S. Green, A. G. Loton, R. N. Riddell, C. E. Eckersley-Maslin.

Auxiliary Air Force Reserve of Officers

General Duties Branch

Flt. Lt. the Hon. H. C. H. Bathurst relinquishes his commission (October 21).

R.A.F. Appointments

General Duties Branch

Wing Commanders.—A. C. Bayley, to Headquarters, Training Command, Market Drayton; for Air Staff duties, 6.10.37. R. A. George, M.C., to R.A.F. Station, Hawkinge; to command, 25.9.37.

Squadron Leader.—R. H. S. Spaight, to Directorate of Staff Duties, Air Ministry, vice Sqn. Ldr. E. H. Hodgson, 4.11.37.

Flight Lieutenants.—R. H. Hobbs, to R.A.F. Station, Calshot, 9.10.37. J. N. McAuley, to No. 220 (General Reconnaissance) Squadron, Bircham Newton, 9.10.37. D. S. J. Miller, to No. 4 (Army Co-operation) Squadron, Odiham, 1.11.37. W. J. Hickey, to No. 24 (Communication) Squadron, Hendon, 23.10.37. S. Keane, to No. 4 Flying Training School, Abu Sueir, Egypt, 5.11.37.

Equipment Branch

Squadron Leader.—F. H. Sims, to Directorate of Equipment, Air Ministry, 3.11.37.

Flight Lieutenants.—A. E. Haes, to No. 47 (Bomber) Squadron, Khartoum, 23.10.37. P. Alderson, to No. 3 Equipment Depot, Milton, 25.10.37. W. A. Stagg, to Headquarters, Coastal Command, Lee-on-the-Solent, 1.11.37.

Accountant Branch

Squadron Leader.—S. C. Wyatt, to R.A.F. Station, Halton, 29.10.37; for Accountant duties, 29.10.37.

Flight Lieutenant.—C. F. Goatcher, to Headquarters, No. 6 (Auxiliary) Group, London, 8.11.37.

Medical Branch

Flight Lieutenants.—L. M. Corbet, to No. 5 (Army Co-operation) Squadron, Chaklala, India, 9.10.37. F. W. P. Dixon, to Home Aircraft Depot, Henlow, 20.10.37.

Owing to the greatly increased length of these lists as a result of R.A.F. expansion, ranks are confined to those of Flight Lieutenant and above.

FOREIGN SERVICE NEWS

Orders and Equipment

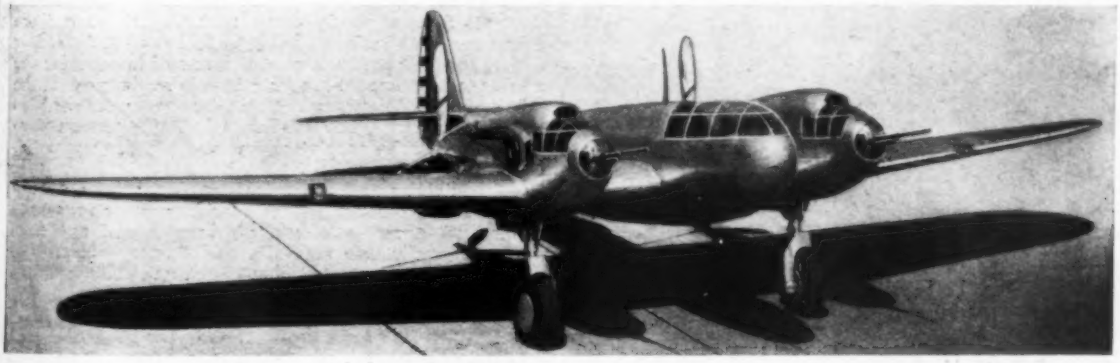
THE Canadian Car and Foundry Co., which holds the Grumman licence in Canada, has sold forty fighters to Turkey and three to Nicaragua.

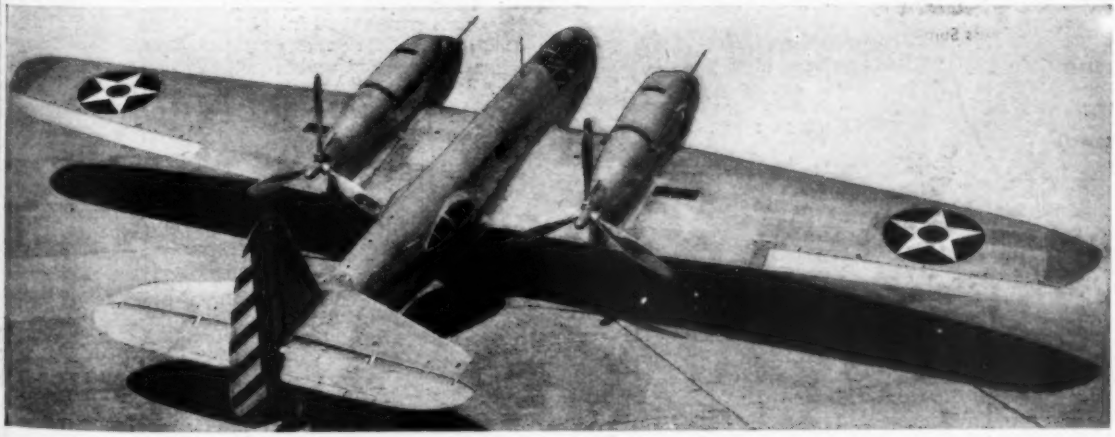
Canada is buying twenty more flying boats on next year's defence budget. Five of the machines—Supermarine Stranraers—are now under construction at the Vickers plant at Montreal. The price is 125,000 dollars apiece.

The fastest Navy dive bomber in the United States is the mid-wing Cyclone-powered Brewster. A single-seater, along generally similar lines, will shortly be delivered to the U.S. Navy.

The Northrop concern, which is building 54 BT-1 dive bombers for the U.S. Navy, has developed the XBT-2, an improved model with a fully retractable undercarriage and constant-speed airscrew.

It seems that the new American Curtiss twin-engined attack machine ordered by the U.S. Army Air Corps will have the Pratt and Whitney Twin Hornet engines.





UNORTHODOX: Two illuminating new views of the American Bell Airacuda ("Tiger of the Sky") pusher multi-seater fighter fitted with two 1,000 h.p. Allison liquid-cooled engines with exhaust-driven superchargers. Two "cannons" are mounted in the nacelles and there are Browning machine guns in fuselage "blisters." The prototype machine is now on test.

COMMERCIAL AVIATION

FULL-SIZED : Some idea of the size of the A.W. Ensign and, in particular, of the retractable undercarriage legs and wheels, may be gathered from this *Flight* photograph.

THE WEEK AT CROYDON

Foggy Predicaments : Record-Breakers at a Commercial Airport : Interesting Figures : Wreckage

A CERTAIN amount of interruption was experienced in air traffic last week owing to widespread fog. On Thursday conditions were so bad that a Swissair Douglas D.C.3 flew from Switzerland to Croydon, but was unable to land and had no alternative but to make for Brussels and land there. The failure to get in at Croydon, though the machine was fitted with approach equipment, was ascribed to the unsatisfactory nature of the airport, and it is said that at a bigger airport less surrounded with obstacles the pilot would have had little difficulty in getting down.

Queer for passengers *en route* from Zurich to London to find themselves, after much more flying than they had bargained for—or paid for—spending the night at Brussels, but not so queer a predicament, nevertheless, as that in which a certain prominent member of the Jewish community once found himself. He had selected a route which did not fly over Germany, but weather conditions made it necessary to seek refuge at a certain well-equipped German aerodrome. During the delay, which luckily was not more than an hour or so, he remained in the cabin, which (like the deck of a ship) was British territory. People who badly wanted a word with him were unable to induce him to leave the machine and courteously respected the neutrality of "British soil."

Just before F/O. Clouston and his companion were due to arrive at Croydon the authorities sent a circular to all companies requesting employees not to swell the crowd in order that the lamentable scenes which occurred on a previous occasion when the Metropolitan police got into such a tangle should be avoided. All very well in a way, but there are such funny people around on these occasions and such a general air of "Cup tie" type jollity that it is a little hard if employees are to be debarred from any glimpse of the fun save from the roof of the building. As the arrival did not take place until the Saturday afternoon, most of the enthusiasts melted away and there were, I am told, more police than crowd, and in consequence the Metropolitan police "were just too wonderful." The flight itself was magnificent and proved beyond any shadow of doubt whatever it was meant to prove, but it was nothing to do with commercial aviation or with our purely commercial airport. Why should one be followed in at the airport gates by Black Marias full of police and pestered by strange myrmidons of the Law when engaged in one's lawful pursuits? Why should regular commercial flying be put out of gear and traffic control be rendered difficult? Why should rostrums be erected and speeches made? Why should the mob be encouraged to invade commercial premises? And why should pilots and managers be alarmed by unnecessary obstacles on the air routes—drifting derelict balloons being quite enough, anyway?

Unacclaimed

Long ago the authorities insisted on allowing the start of the King's Cup Air Race to be made at Croydon and the place was infested with rocketing aeroplanes and with hordes of men running around waving flags. When we protested they were hurt and surprised, but eventually they saw reason. One of these days they will see reason about this matter, too, and forbid record-breaking attempts from a purely commercial airport where there is no room for that sort of thing. More or less forbidding airport people from their own tarmac and impounding the whole place for record-breaking friends reminds one of the old smuggling days, when children were advised to "Watch the wall, my darling, when the gentlemen go by." The Excise people knew that smuggling was wrong but couldn't stop it. Perhaps the same holds good for the Air Ministry authorities to-day. Incidentally, nobody erects hustings, nor are there beer-flavoured cheers when commercial pilots, who have achieved useful and noteworthy long-distance flights in the ordinary run of business, drop in on us at Croydon—but that's the way of the world.

Some interesting Croydon figures have just come to hand. The first six months of the year showed a total of 64,884 passengers, of which 38,743 travelled to or from Paris, Imperial Airways carrying 23,385 of them. Imperials carried 1,241,328 lb. of freight and K.L.M. transported 1,029,326 lb. out of a total of 5,420,089 lb. North-Eastern Airways did well for a fairly newly formed company, carrying 288 passengers between Croydon, Doncaster, Aberdeen and Perth. During the first half-year of 1937, too, K.L.M. carried 12,303 passengers in and out of Croydon.

For weeks and weeks there has been a smashed, untidy mass of wreckage opposite the Hotel, where an aeroplane skidded on icy surface and knocked down the railings. Thanks to F/O. Clouston's arrival, and in expectation of possible big noises in high hats, the mess was hurriedly tidied up just before he was due in, otherwise it might have offended our eyes for months. So there is, perhaps, something to be said, after all, for the use of Croydon by record-breakers.

A. VIATOR.

Atlantic Navigation

THE G.A.P.A.N has awarded the Johnston trophy for navigation to Capt. A. S. Wilcockson in recognition of his work over the Atlantic. He made six experimental flights this year. The trophy is a memorial to Sqdn. Ldr. E. L. Johnston, who died in the R.101 disaster in 1930

ATTACK and DEFENCE

The Debate on British Civil Aviation : Departmental Inquiry Promised

IT is unfortunate that, this issue being devoted to the interests of British aircraft industry in general, it is not possible to give more than a summary of the points raised in the House on Wednesday of last week when it was moved by Mr. Perkins that a public inquiry should be made into the present state of British civil aviation.

He opened the debate by stating once again that our civil aviation was by way of being a joke to operators and others outside this country. He then raised five major points which, in brief, were as follows:

1. That British Airways and Imperial Airways are directly or indirectly subsidised to compete on the Paris run.

2. That no British civil air liner is available for sale abroad. British Airways, for instance, uses American and German machines and the colonies now use foreign machines almost exclusively.

3. That municipalities all over the country are losing a great deal of money—from £2,800 to £20,000 a year—on the airports which they have laid out at the expense of the ratepayers. Meanwhile, Service aerodromes are being laid down by the dozen in the same areas. The ratepayers feel that they have been let down by the Government.

London's Airport

4. That nothing has been done about a new and adequate aerodrome for London. Croydon has inherent drawbacks and Gatwick proved to be unsuitable. He said that the original prospectus for the flotation of Airports, Ltd., the owners of Gatwick and Gravesend, mentioned a promise by the Air Ministry to make an annual payment to the company during fifteen years, and that the Air Ministry, in fact, encouraged the flotation of the company by this promise. In order to save their face the Air Ministry have since given the company two Reserve School contracts. Heston is at present too small and the L.C.C. have refused to do anything because it is the responsibility of the Air Ministry.

5. That with a few exceptions all the British internal and external services are operated under the same influence or control and that booking facilities are denied to anyone outside this ring—North-Eastern Airways, for example. Furthermore, this amalgamation made it difficult both for the pilots employed and for the Government, who might be told that unless they paid a subsidy the entire airline network would be closed down. The whole of British aviation is coming under the control of two financial houses—D'Erlangers and Whitehall Securities.

He said that civil aviation should be taken from the militaristic Air Ministry and given to the Ministry of Transport.

Mr. Perkins then went on to state the case for the pilots and their right to co-operate with airline managements in the matter of operational conditions and equipment. He cited the occasion when an Imperial pilot had been employed for eighteen hours without rest and mentioned a number of points on which only a pilot's opinions could be taken. He reiterated his statement that there had been victimisation and was ready to prove it in ten or fifteen cases.

Healthy Criticism

He resented the suggestion that it was wrong to criticise Imperial Airways and then continued to say that the subsidy paid to them had been more than doubled in the last two years, while both the dividend and the directors' fees had been increased. The recent officially inspired statement in the Press giving pilots' salaries would be found to be greatly exaggerated. In any case new pilots were certainly being taken on at lower rates.

Figures were then given by Mr. Perkins concerning accident liability in comparison with D.L.H. (in which Imperials came out rather badly) and concerning ex-Croydon passenger figures (which were given as only 34 per cent. for Imperials). He compared the Swissair service to Switzerland, and others, with those operated by Imperials, and criticised the fact that new landplanes had not been delivered to time. The question of the lack of blind-approach and de-icing equipment was a very serious one, and he suggested reasons why the "only practical protection," the Goodrich, was not used by Imperials. He had a good word to say for the published fact that Killfrost was being applied to all Imperial machines this winter.

Mr. Perkins concluded by asking for a public or a private inquiry.

Lt. Col. Moore-Brabazon seconded the motion, and alluded to Mr. Perkins' speech as "the first aviation philippic." He suggested that the big newspapers had been effectively muzzled and that criticisms, consequently, very rarely appeared. On the whole, however, he had a number of good words to say for Imperial Airways. The question of booking facilities was brought up again, and he gave a specific case of severely unfair treatment in the case of North-Eastern Airways, whose service, in any case, was not run in competition with any other operator. The Maybury Committee's licensing suggestion should be got under way at once.

His supposition of the state of affairs which would result if the War Office ran London's transport was pointed and effective, and he once again spoke of the need for diesel development. He concluded by hoping that the House would grant the inquiry in order to see that the development of civil aviation was proceeding along sound lines for post-armament development.

Mr. Muff then spoke for the aerodrome owners.

Sir Murray Sueter moved an opposition amendment, but criticised the Air Ministry on the matter of the South Atlantic mail service delay and on the case of the municipalities. Col. Ropner seconded the amendment.

Mr. Mander and Mr. Montague afterwards spoke in favour of the motion.

Lt.-Col. Muirhead, the Under-Secretary of State for Air, then replied to all the points which had been raised. He mentioned the fact that the Gorell Committee in 1934 and the Maybury Committee in 1936 had dealt with such matters quite adequately.

The inadequacy of London's airport services was, he said, perhaps the fault of London in having grown to such a size before flying was introduced. He mentioned the D.H. 91 as an example of Government support for civil prototypes and said that much would be lost if the link between the air transport and the Air Ministry was broken. The suggestion that doubtful trade motives lay behind the fact that any particular de-icer or anti-icer had been viewed unfavourably was not right. Once again he denied that there had been any victimisation of pilots, and said that a commercial company could not be forced to recognise any particular organisation.

The Ministry's Statement

The Secretary of State had, however, authorised him to make the following statement:

"In view of the specific allegations that have been made the Secretary of State will, in fairness to both sides, set up a departmental inquiry into the allegations as to inefficiency made during the debate The findings, with reasons, will be published.

"There will be no enquiry into matters which were dealt with by the Maybury Committee, the Government decisions on which were announced and approved by the House.

"The Secretary of State authorises me to say that he will discuss with the Government directors of Imperial Airways the system employed by that company in dealing with its staff, including the methods by which pilots and others are enabled to have their grievances and representations fairly considered.

"It is impossible for the Government to conduct the business of the company, and the Government will not go into specific grievances or the cases of individual pilots. Nor will it dictate to the company as to the recognition of any particular union. The company has already stated that it has no objection in principle to collective bargaining."

The motion was talked out.

In accordance with the announcement made by Lt.-Col. Muirhead it has been decided to invite Lord Cadman to act as chairman at the inquiry. Other members of the committee will be Sir Warren Fisher and Sir William Brown; Mr. W. W. Burkett, of the Air Ministry, will act as secretary.

Imperial Connections

NOW that the Imperial route to the Cape goes by the east coast to Durban, where it is taken over by South African Airways, the internal points which were previously on the trunk route are fed by Rhodesian and Nyasaland Airways and by Wilson Airways

R.A.N.A.'s new time-table involves two twice-weekly return services, each connecting with the main service at Beira, between this point and Salisbury, Buluwayo, Pietersburg and Johannesburg and between Beira and Blantyre. Other twice-weekly services are operated between Salisbury and Blantyre and between Salisbury and Lusaka.

Commercial Aviation

The Shorter Gold Coast Route

AIR FRANCE state that their recently opened service to the Gold Coast in conjunction with Aeromaritime (a subsidiary of the steamship line, Chargeurs Réunis) is proving so popular that a large number of bookings from London has had to be refused by them. The service brings Accra, the commercial centre of that British colony, within four days of London, showing a great saving of time as compared with the fastest surface route.

Jersey by Night

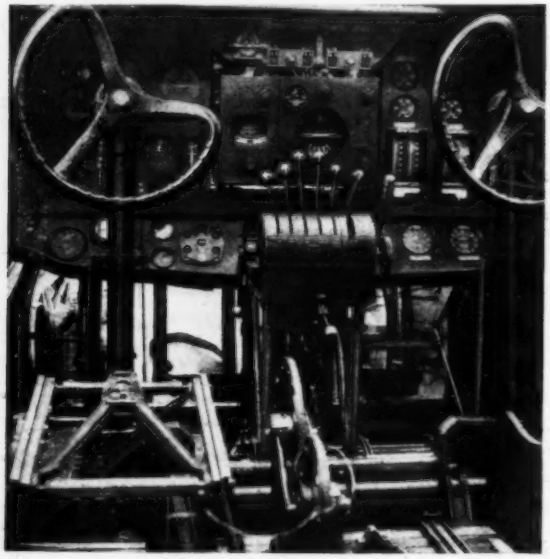
AFTER careful enquiries into passengers' special needs, Jersey Airways have now worked out the details of their Christmas services which, between December 23 and 29, are suitably expanded and timed for the special conditions. On Christmas Eve, for instance, three return services will be run between Jersey and Southampton.

The last of these, ex-Jersey, will leave at 4.30 p.m. and will, consequently, involve night flying. Although this is Jersey's first essay in the business of scheduled night flying during the winter months, there is nothing really new about it from the pilots' angle since similar conditions are now faced every morning when the 6.25 mail service leaves Southampton. It will be remembered that with the construction of an airport in Jersey the company had no difficulty in obtaining the long-promised mail contract; only the necessity for daily time table alterations with beach landing prevented them from obtaining this contract a year or two ago.

Imperial Items

SEVERAL interesting pieces of news may be gathered from the years' report of Imperial Airways. The chairman's speech has already been dealt with elsewhere, but the list of the company's fleet shows that three new ships have been ordered from Short Brothers and have been named *Champion*, *Corinthian* and *Cameronian*. The two latter are already in service. *Courtier* has been written off after the Phaleron Bay accident, though, judging from photographs that have appeared, she did not look beyond repair. For the first time the list shows no ships of "City" class. The last three have been sold after many years of faithful service.

Incidentally, the boats no longer fly through to Durban, but go by stages. The end of the first stage is Alexandria, whence another boat takes the mail on to Kisumu and a third boat completes the journey. As a rule there are about three boats at both these ports. This ensures continuity of services, and also gives the crews more experience. *Castor* has not been on service since she was reported as arriving at Rome (Lake Bracciano) on September 12. The flight was continued on the following day by *Challenger*.



STANDARD LAYOUT: The control cabin of the A.W. Ensign, showing how the general instrument layout is similar to that of the Empire boat. Pilots, after all, may on occasion be expected to make a change-over. The tandem-placed wheels in the centre foreground are for adjustment of the fore-and-aft and directional trimming tabs. (*Flight* photograph.)

The Penang Base

WORK has now been started on the development of Glugor Bay as the Penang flying-boat base on the future Empire route. This base, of course, is the one previous to Singapore, where a further area of land is now being reclaimed, on the Far Eastern run.

The Imperial Staff Manager

MR. R. E. RICHARDSON has been appointed by Imperial Airways to the position of staff manager, made vacant recently by the resignation of Air Vice-Marshal Sir T. Webb-Bowen. Major H. G. Brackley, of course, continues in his capacity of air superintendent, and is in charge of the piloting staff.

The Langstone Question

AS a result of negotiations between the Air Ministry and the Portsmouth Docks and Airports Committee, the Corporation has now been recommended to proceed with the Langstone Harbour project. On Tuesday the Corporation was due to discuss the matter and to decide whether they should promote a Bill for the purpose.

The present estimated cost is £1,348,343, of which the Air Ministry has offered to pay 50 per cent. up to a maximum figure of £600,000. The Government has also offered to guarantee a yearly income of £40,000.

Bombay—Kathiawar

THE new Bombay-Kathiawar service has now started. It was recently inaugurated by Sir Thomas Stewart, Minister for Communications, at Juhu, near Bombay. Bhavnagar, Rajkot, Jamnagar and Porbunder are the points at which the service calls. This service, operating by Air Services of India, will be operated four times a week. Eventually, it is hoped, a daily service will be available. The machines used are a D.H. Rapide, an Airspeed Courier and two Percival Vega Gulls.

Stockholm—Helsingfors

THE Stockholm-Helsingfors service is claimed to be one of the most remunerative runs in Europe. According to recent statistics all machines on this run have had at least 60 per cent. of their seats occupied, and a similar degree of support has been given to the Finnish home services during the past summer season. During the first nine months of the current year an aggregate of 6,833 paying passengers, 109,223 kg. of luggage, 70,842 kg. of mails and 44,323 kg. of air freight have been carried between Stockholm and Helsingfors.

During the winter months the traffic between Sweden and Finland is reduced to one daily (morning) service, but the operation of two daily services will be resumed as from March 1, and it is more than likely that even a third daily run will be added, possibly in the form of continuation of the Stockholm-Tallinn-Moscow experiment that was undertaken this summer by Aerotransport and Aeroflot.

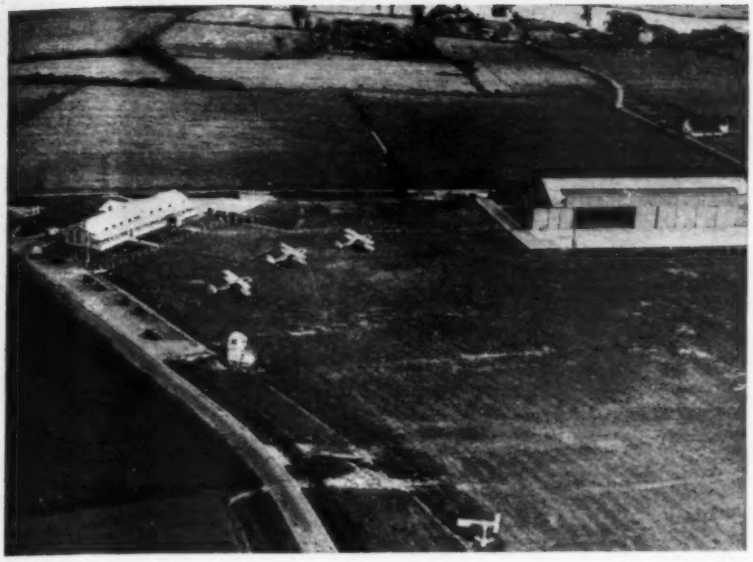
European Disasters

ON the afternoon of November 16 a Ju.52 on the Sabena Frankfurt London service hit a brickworks chimney on the outskirts of Ostend aerodrome while attempting a D/F approach in conditions of practically no visibility. All the eleven occupants were killed and the disaster was all the more tragic because the machine was carrying the Grand Duke and Duchess of Hesse with their two children and retinue to the wedding of the Grand Duke's younger brother in London.

The machine on this service normally calls only at Brussels, but on this occasion the weather had closed in at Haren airport and the pilot, Capt. Lambotte, was advised to land for fuel at Ostend which was, at that time, clear. Unfortunately, fog descended on Ostend shortly afterwards and he was forced to attempt an approach on D/F bearings and rockets. According to sundry reports the machine took an approach line which was dangerously near the chimney concerned and on his final attempt the wing of the machine struck it.

Three days before there had been two serious accidents involving transport machines in eastern Europe. The accidents occurred at almost the same time in the evening of November 12 and in each case the machine concerned was making an approach to an airport.

In one case, that of the Polish L.O.T. Electra, at Warsaw, in which four people were killed, the landing was being made in fog. No definite reports of bad weather are given for the second case, but the evidence points to the possibility that the cause was similar. This second machine was a D.L.H. Ju.52 and the landing was being made at Mannheim; ten persons were killed.



PRIVATE FLYING

WESTERN AIRPORT: Although Weston-super-Mare's airport is largely concerned with Western Airways' Severn ferry and other services, private owners and club pilots should find it useful on occasion. One or two of them certainly did on that awful day following this year's London-Cardiff race, when the cloud-covered Cotswolds were rather in the way of further progress in an easterly direction.

Topics of the Day

Caution . . .

KNOWING that the only real danger of collision in the air, small as it is, concerns machines which are either coming in to land or making a circuit, I always try to be particularly careful when flying in the vicinity of an aerodrome.

This caution probably dates from the day, eight years ago, when, during an approach from a very early solo flight, most of the sky was blotted out by the underparts of a Liberty-Nine. This machine was apparently making S-turns on its way in at the same time, and the pilot had not seen me until the very last moment—if then. Since that time sundry minor avoidances have been necessary, and after each one I have made a special new vow to grow eyes in the back of my head, or, if evolution failed me in providing these useful additions, to make two or even three circuits if there was any doubt at all about things.

More recent experiences have involved me in skirmishes at a distance with other machines during which I knew perfectly well that our respectively different fields of view might prevent one of us from seeing the other at some critical moment. In such cases I have always tried to see that discretion remained the better part of valour unless I happened to be flying something with outstanding manœuvrability *and* an all-round view.

In one case I was flying for the first time a rather biggish complicated type in which I did not feel competent to making very steep gliding turns near the ground. Coming up behind me during the circuit was a military trainer. Obviously the pilot had not seen me, and I knew that he certainly would not see me after his nose had gone up in a slow final-approach glide; furthermore, his natural approach speed in a straight glide would be 5-10 m.p.h. faster than mine. In fact, I didn't go round again, but made a wide circuit, saw to it that he turned in first, and then motored down on to a narrow strip of the aerodrome which I knew was not likely to be used by anyone else.

. . . And Long Life

NEEDLESS to say, one is not always so virtuous or so lucky. The tendency is to lose patience with any other pilot who, though legally in the wrong, is trusting you to get out of his way, and to trust, in your turn, to a little skill at the last minute if the opposite number persists in his attempt to bluff you into making another circuit.

Nevertheless, the pilot who never loses his patience in such circumstances is the one who will live to a ripe old age. The same sort of question crops up in all forms of transport in which separately controlled, steerable vehicles are involved. The motorist who cannot wait for a few minutes behind a slowcoach until the road is sufficiently clear is taking the same kind of chances.

Before he landed at Croydon F/O Clouston made half a dozen circuits and almost one touch-down. He didn't appear to be particularly tired—the Comet is not quite the tricky racing projectile which it was once considered to be by the layman—and he must have wanted to get down as soon as was reasonably possible. But visibility was poor, there were other machines about, and he was obviously reluctant to finish a first-class long-distance adventure sitting with his passenger in a heap of firewood. Quite apart from the danger involved, such a finale looks so very silly.

Which reminds me that I looked round once just before landing at a busy airport (after a forty-minute flight in a machine which cruised at 70 m.p.h.) to see an enormous transport aeroplane with a foreign registration in the act of putting down not a hundred yards away on my left. The pilot may have been a good one, he had a most respectable field of view, and he could probably have turned that transport twenty or thirty degrees off its course just as soon as it had landed. Nevertheless, he did not know that what served for brakes on my machine were acting rather erratically and that the outfit had a little way of swinging to the left after it had run a few yards. Having seen this monster, I made quite, quite sure that it would swing to the right on this occasion, and was not far from writing off a wing tip on a petrol pump or some similar obstruction.

Circuits and Things

THE most annoying of all occasions is that after one takes off following the pilot of another machine of the same type, keeping him on your left, and climbing at about the same rate. It does not seem to be good manners to climb up over him or to dive below, and he persistently refuses to start his left-hand circuit. Eventually, when both machines are about five miles from the aerodrome, the fact that he is going off on a cross-country and not making a circuit at all slowly sinks into the ebony.

However, thank goodness for aerodrome rules. I once left an aerodrome while massed joy-riding was in progress—machines full of waving humanity taking off and landing at half-minute intervals—and I have rarely been so frightened. The left-handed rule *was* kept after a fashion, but the circuits were started in steep climbing turns off the ground, and the landings were made across wind in order to save taxying. Furthermore, there were balloons being burst all over the sky by some hero in a 504—a fact of which neither I nor the man who had given me the take-off gesticulation appeared to be aware until I had got away. I went off in a long, straight, flat climb, rubber-necking for all I was worth, and did not turn on to my course until I was at least three miles from the aerodrome boundary.

As I've said before, safety first. INDICATOR.

Private Flying

FROM the CLUBS and SCHOOLS

MARSHALL'S

ALTHOUGH fog was evident at Cambridge last week, cross-countries were flown to Sywell, Hatfield and Norwich, and the total time spent in the air amounted to 50 hr. 55 min.

YAPTON

The weather was not exactly good for flying last week and only 26 hr. 55 min. was logged. Messrs. R. G. Hall and A. Ryner made their first solos and Mr. I. S. C. Henderson completed his "A" licence tests.

C.A.S.C.

Owing to the thick fog experienced last Sunday only four members managed to reach Cambridge, where 2 hr. 30 min. flying was done. To-night, Thursday, the Corps are holding a dance at the First Avenue Restaurant, Holborn.

CINQUE PORTS

Lympne once more graciously received all the fog-ridden aircraft that were unable to reach London last Sunday. Another creditable first solo was made by Mr. J. Richards, who underwent only 2 hr. 55 min. dual. Mr. G. E. Winter passed his "A" licence tests. Flying for the week totalled 51 hours.

BORDER

Carlisle is living in an atmosphere of clarity while other parts of the country cannot see each other for fog, for which reason the Border Club members are concentrating on solo flying. Cross-country flights have been made to many places, including Abingdon and Liverpool. Three machines took part in the Newcastle Dawn Patrol on Sunday.

HANWORTH

The London Air Park Flying Club are, of course, very proud of two of their members—Mrs. Kirby-Green and F/O. A. E. Clouston. Mr. F. A. Nicholson, late of the R.A.F., has taken on the duties of Instructor. Mr. F. S. Appi, who recently obtained his "B" licence, has taken a post as personal pilot to another member. Total flying for the week amounted to 48 hr. 5 min.

SOUTH COAST

Mr. Hamilton, having just flown to Scotland and back, is now contemplating a tour of the European capitals in his B.A. Eagle. The Portsmouth Aero Club and Brooklands Club paid a visit on Sunday, November 13. Mr. C. L. Pashley, chief instructor, has taken over the additional duties of Secretary in place of Mr. B. S. Smallman, who is now manager of the Brooklands Flying Club. Twenty-five hours' flying has been done.

LONDON

The flying time for last week amounted to 49 hr. 55 min. "A" licence tests were completed by Messrs. R. Bishop and Wilkins.

STRATHTAY

With a slight improvement in weather the total flying times for the week ending November 14 went up to 16 hours. Messrs. F. Walker and A. S. Turnbull have joined as pilot members.

HERTS AND ESSEX

Flying was possible on thirteen days out of the fortnight ended November 18 and 155 hr. 58 min. was logged. The total for October was 252 hr. 52 min. Mr. D. McMartin made his first solo and Miss V. W. Holmes completed his "A" licence tests.

MADRAS

The annual competition for the trophy presented by the Raja of Pithapuram was started during October, when ten members participated in a short cross-country flight. Mr. Haig qualified for his "A" licence. Messrs. Shenoy, Aserappa and Kearney went solo. Flying for October amounted to 113 hr. 45 min., despite the north-east monsoon weather.

BROOKLANDS

Brooklands Christmas cards are now obtainable from the secretary. Mr. W. Orton, who has during the past year obtained his "B" licence and 2nd Class Navigator's Certificate, has now added his Ground Engineer's licence to his collection. Messrs. Edmonds, Heywood and Harrison have completed "A" licence tests and Mr. Dutt has obtained his "B" licence. Flying for the week totalled 49 hours.

NEWCASTLE

Weather conditions permitted a very successful dawn patrol to be held, but only one of the six visiting machines was spotted by the defenders. The spell of fine weather enabled a total of 25 hours' flying to be recorded for the week. An ambitious scholarship scheme has been announced by Mr. F. L. Turnbull. This is open to men between the ages of 17 and 35, taking a £25 "A" licence course. A free scholarship will be given to one in every six entrants who proves to be the most competent pilot. Marks will be allotted for aptitude and proficiency during instruction (25 per cent.), for performance during training (25 per cent.) and during "A" licence tests (50 per cent.). The scholarship will be open to persons joining under the scheme up to January 31, 1938, and the results will be announced not later than May 1, 1938. The idea of the scholarship is to pass on the benefit of the increased subsidy to those who are anxious to learn to fly but had been prevented from doing so by the cost.

A Soaring Loss

THE German engineer, Herr Arthur Martens, who perished in the accident to a Belgian air liner at Ostend on November 16, will be remembered for the leading part he took in the early gliding meetings at the Wasserkuppe in Germany about fifteen years ago.

It was at these meetings that the art of human soaring flight was first mastered, and Martens was the first pilot in the world to stay in the air in motorless flight for over an hour. On August 18, 1922, he took off at 5.30 p.m. into a westerly wind of 16 to 18 miles an hour, flying a Vampyr glider which fellow students of the Hanover technical school had designed. Soaring to and fro along a beat between the Wasserkuppe and the Pferdskopf, he gradually rose 100 metres above his starting point, only to lose all this height, and more, at the end of 25 minutes during a lull in the wind. But the wind freshened again just in time to save him, and before long he had won a prize of 100,000 marks for the first soaring flight of 40 minutes' duration. Martens concluded his epoch-making flight with a long glide down into the valley below, finally landing six miles from the start after being in the air for 1 hour 6 minutes.

The record was broken the very next day by another Hanover student, Herr Hentzen, flying the same machine, and on August 24 the same pilot soared for 3 hours 6 minutes, a feat which was only surpassed two months later by the French pilot Maneyrol during the first British soaring meeting at Itford Hill, near Lewes.

Martens continued to take a leading part in German gliding activities up till 1925, in which year he was running a gliding school on the Wasserkuppe. The school was shortly afterwards merged in a national gliding organisation, the Rhön-Rossitten Gesellschaft, and Martens appears to have given up motorless flying since that time. He had, however, made many soaring flights which were notable achievements in their day, and had attended soaring meetings at Rossitten in East Prussia and at Asiago, in Italy, besides those at the Wasserkuppe. But, though his pioneer flight of 1922 set up world's records for duration, height and distance, he never held any of these records again. His Vampyr, the prototype of the modern high-performance sailplane, is now preserved for all time in the Deutsches Museum at Munich.

The Yorkshire Party

SOMETHING like 250 members and guests of the Yorkshire Aeroplane Club, including the Mayor and Mayoress of Harrogate (Alderman and Mrs. J. Boehrer Charles), were present at the club's annual ball, held at the Hotel Majestic, Harrogate, on Friday.

Trophies were presented by the Mayor during dinner. The Grimthorpe Cup, details of which have already been given in *Flight*, was awarded to Mr. J. F. H. Naylor. Mr. G. V. Williamson, the club's secretary, took the second prize, and the third award, with the Downs Cup for the pupil making most improvement during the year, was presented to Mr. Frank Leach. Lord and Lady Grimthorpe were, of course, among those present.

Scottish Ball

BUSINESS engagements prevented Lord Weir from accompanying Lady Weir to the Scottish Flying Club Ball in the Central Hotel, Glasgow, last Friday. He is president of the club in which he has taken the closest interest from the early days. However, later in the evening Viscount Trenchard, a guest of the Weirs, came along. Lady Weir received the guests and, as might be expected in the case of one of the most flourishing clubs in the country, the event was the usual unqualified success.

A Job in Jo-burg

THE Rand Flying Club requires the services of a ground engineer, with A, B, C and D licences, to take charge of the workshops. In these are housed Gipsy Moths, a Miles Hawk and Magister—the club's fleet—as well as such American types as a Waco, a Cessna and an Aeronca. The club will refund the applicant's fare after, say, six months of satisfactory service, and the salary offered is well up to standard.